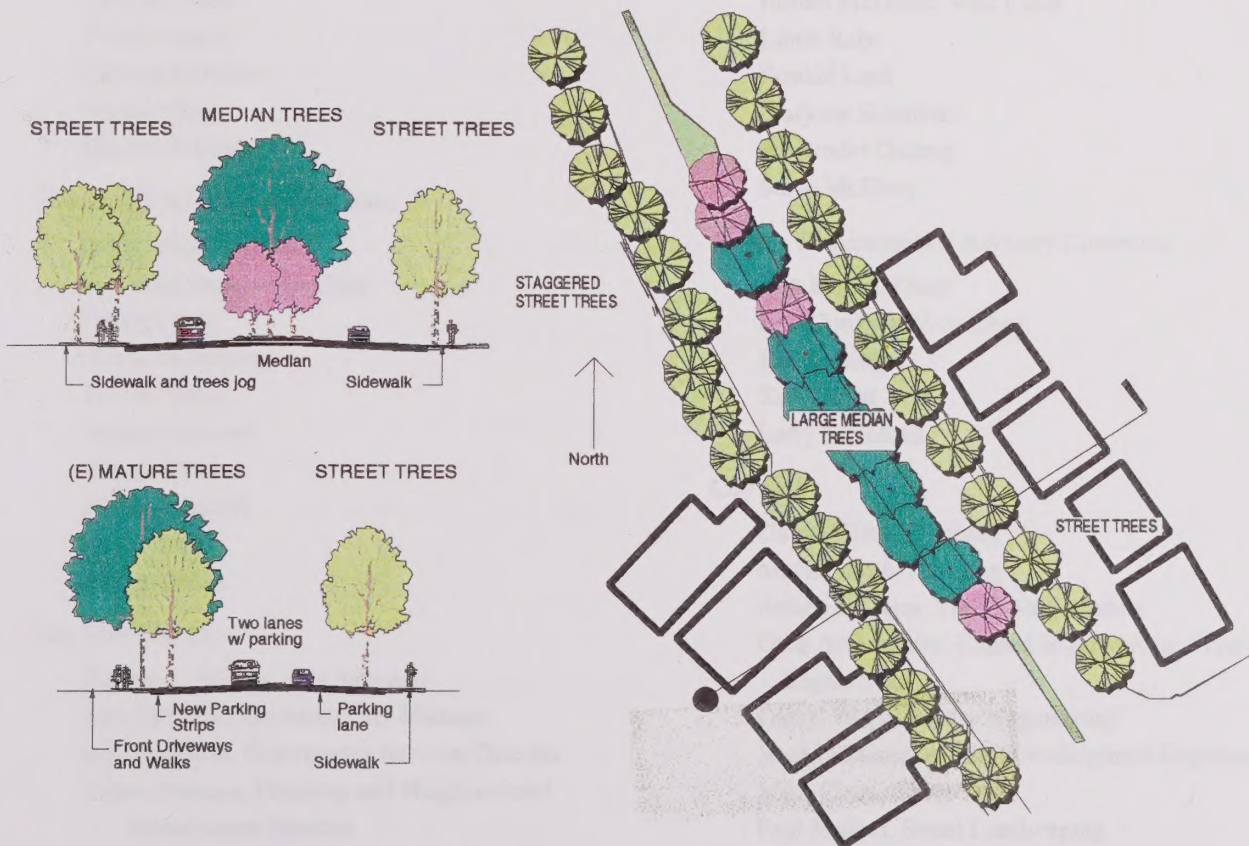
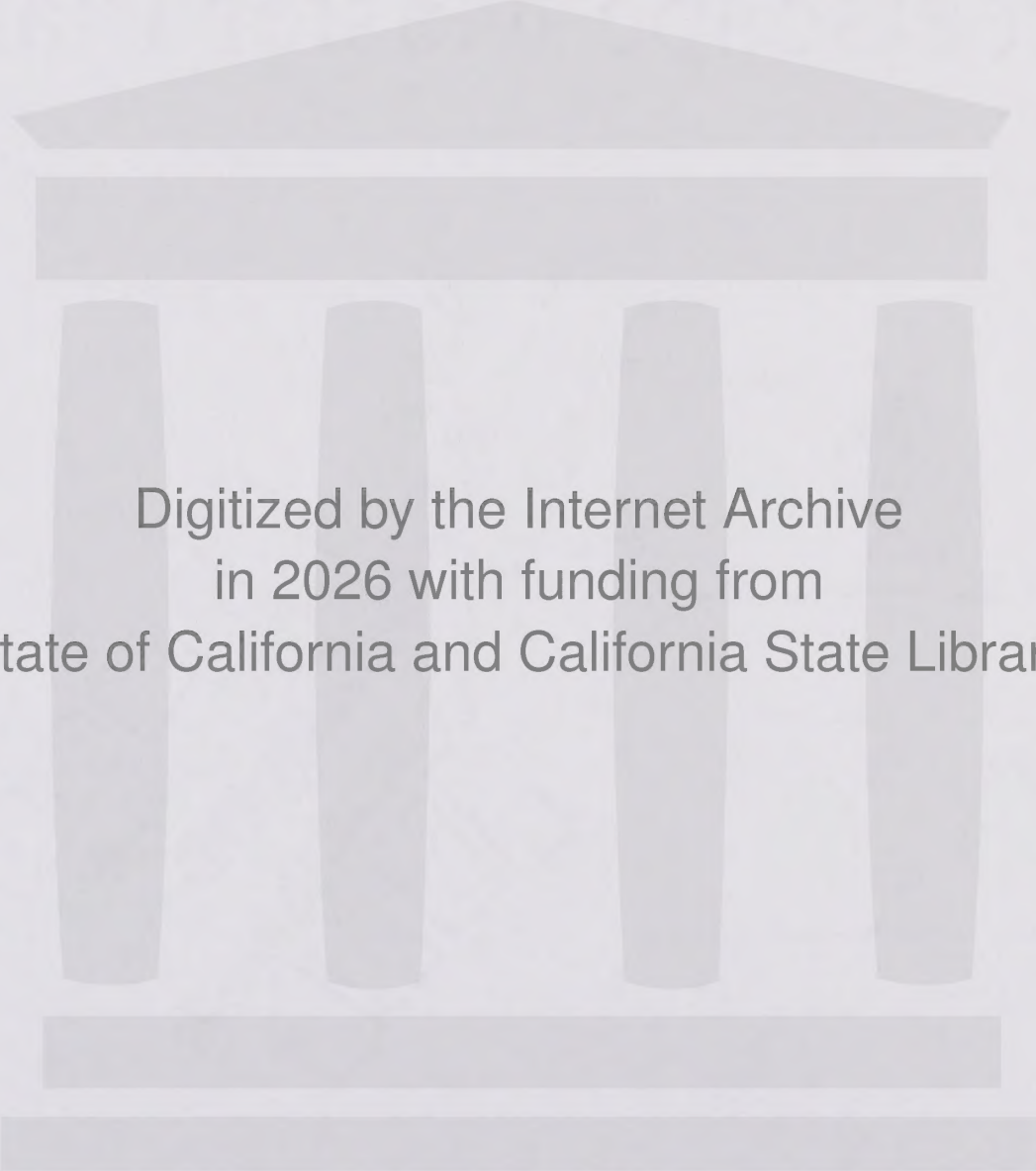


City of Milpitas

Streetscape Master Plan



Adopted by
Milpitas City Council
September 19, 2000



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City of Milpitas Streetscape Master Plan

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Executive Summary

The City of Milpitas Streetscape Master Plan (Master Plan) is the result of six months of work by a team consisting of Master Plan Task Force, city staff and the consultants. The process began with a request for proposals from consultants to develop a comprehensive master plan. The primary tasks were to review existing conditions and establish a base line upon which to build a master plan; to develop and establish goals and strategies for streetscape development; to determine technical feasibility and implementation costs associated with a streetscape enhancement program; to identify a capital improvement program; and to evaluate conditions and develop a plan for long term sustainability of the historic O'Toole Elms. The consultant team¹ was selected and began working closely with representatives from the Citizens Advisory Committee, Bicycle Transportation Advisory Commission, Parks Recreation and Cultural Resources Commission, Planning Commission, Vision Corridor Committee and city staff. The Master Plan was designed to serve a multitude of users. The very nature of the work program indicates the city's level of interest and commitment to develop, enhance and maintain its streetscapes and urban forest.

The Master Plan is based on the understanding that attractive streetscapes are a benefit to the community -- economically, environmentally, visually and psychologically. Most great cities throughout the world have one thing in common -- attractive streetscapes. The two primary elements that make for memorable streetscapes are decorative, effective lighting fixtures and large, healthy trees planted in orderly patterns. In addition, these same cities have great parks or larger open spaces where even grander trees, (e.g. skyline trees, landmark trees, heritage trees) can be planted as specimens or in groves to thrive and provide the citizens with not only the qualities mentioned above but also a sense of pride and identity. The Master Plan recommendations were developed with this thinking in mind.



The Master Plan contains guidelines and recommendations for the varied streetscape conditions that exist or can be foreseen in the future. Sample recommendations are included to further explain the Master Plan guidelines and standards using several high priority streets (including North Milpitas Boulevard and East Calaveras Boulevard). The Master Plan includes goals,

Ideas of how the Master Plan guidelines and recommendations could be applied to actual locations in Milpitas are indicated by this symbol in the margins of the plan.

¹ The consultant team consisted of Amphion (Landscape Architects), Sealana and Associates (Arborists), and Russ Mitchell and Associates (Irrigation Designers).

City of Milpitas Streetscape Master Plan

strategies and design guidelines for streets by general size, type (freeway, collector, arterials and local), and other physical characteristics such as medians. It also addresses streetscapes by land uses such as commercial, industrial and residential areas, as well as private development considerations. There is a section on planting strips, planting areas behind sidewalks, and sound wall enhancement treatments.

The Master Plan includes design guidelines for major gateways and entries into the city. These are primarily landscape solutions that include suggestions for entry signage elements. Recommendations for streetscape amenities such as street furniture where appropriate are also included. This section includes three different families of furniture each of that might be best be suited for commercial, industrial and residential areas. Furniture recommendations includes benches, trash containers, bike racks, street/pedestrian lighting fixtures, tree grates, signage and decorative paving.

Throughout the Master Plan there are recommendations for upgrading existing streetscape situations, as well as guidelines for new streetscape development. There is discussion and recommendations on upgrading existing irrigation systems, installing new systems, and recommendations on uses and expansion of the recycled water system. All public irrigation systems are eventually to be tied to the city's main computerized irrigation control system.

The Streetscape Master Plan is designed to be coordinated with other existing city programs which include protection of assets, inclusion of public art, emphasis on traffic calming, cost recovery from vandalism and coordination with development plans, such as the McCarthy Ranch street landscape design criteria.

Summary of Recommendations from the Streetscape Master Plan

The City of Milpitas has demonstrated interest and a desire to plan, develop, and maintain the streetscapes and urban forest. Based on this planning process, the following recommendations are identified to facilitate effective implementation of the Master Plan. The recommendations are categorized by user.

Residents and Property Owners of Milpitas

- ❖ Support neighborhood, commercial and industrial area programs for replanting of aged landscape areas and maintenance of private landscapes that contribute to the overall streetscape quality.

City of Milpitas Streetscape Master Plan

- ❖ Assist city staff in identification of hazardous conditions by reporting sidewalk damage, hazardous trees, and irrigation leaks to the maintenance staff.
- ❖ Participate in a Street Tree Advisory Committee outlined below.

City Council, Commissions and Other Policy Makers

- ❖ Adopt the Streetscape Master Plan.
- ❖ Allocate funding to support new programs and guidelines identified below.
- ❖ Appoint a Street Tree Advisory Committee of citizens, staff, and technical professionals. The role of the committee could be to:
 - Review short-term tree program progress.
 - Assist staff in the refinement and development of long-term goals and objectives.
 - Promote public awareness of street trees and other streetscape improvements.Ideas include:
 - Creating a tree-planting month.
 - Utilizing Channel 15 - Milpitas Television to promote the greening of the city.
 - Developing public service announcements.- Pursue certification of Milpitas as a “Tree City USA” (a National Arbor Day Foundation program) and support membership in the international organization of “Nations in Bloom” to promote street trees.

Planning, Design and Maintenance

- ❖ Promote Planning, Design and Maintenance staff awareness of Master Plan recommendations and guidelines for street trees and streetscapes and application in public and private projects.
- ❖ Develop and approve alternative curb, gutter and sidewalk configurations that will allow for greater space for trees in the public right-of-way.
- ❖ Incorporate structural soil and planting recommendations into public projects.
- ❖ Develop and approve alternatives to concrete paving materials that will minimize compaction around existing trees, and improve movement of water and oxygen to subsurface roots; (i.e.. structural soil, and decomposed granite used in various cities such as Redwood City and Palo Alto).
- ❖ Update conditions of development to include alternative parking strip and sidewalk configurations, tree installation standards, materials and methods for curb, sidewalk, gutter, and street tree installations.

City of Milpitas Streetscape Master Plan

Streetscape Maintenance Staff

Programs & Community Outreach

- ❖ Conduct an updated street tree inventory as a basis for program development.
- ❖ Establish a computer-based work management system for tree workers, and concrete inspectors which provides information in the field (e.g. assessors parcel data), tree information (e.g. genus, species, dbh, height, etc.), previous inspection data (e.g., dates, activities, actions), and a report generation capability. This system should be networked so that clerical, inspection, and management personnel have direct and continuous access to up-to-minute scheduling, analysis, and report capabilities.
- ❖ Raise public awareness of the street tree and landscape enhancement program. Update policy brochures to be more accessible, user-friendly, and readable to the general public by including additional graphics, multiple language information, and referral/reference information. Post this information on the city web-site.
- ❖ Produce and conduct a periodic mailing of policy information to all property owners in the City of Milpitas. Such mailings can be funded through the general fund, by grants, or can be combined with other city-related mailings.
- ❖ In cooperation with universities and industry associations, install experimental sites throughout the city which utilize alternative design, installation, and maintenance strategies.
- ❖ In cooperation with other departments and groups such as "ReLeaf," prepare grant applications for continued study, inventory, and enhancement of the urban forest.

Standards, Training and Equipment

- ❖ Adopt tree planting standards and update city brochures to show the use of drainage, structural soil, root pruning and root barrier installation methods.
- ❖ Adopt the new standards relating to soil compaction and aeration in areas surrounding trees.
- ❖ Provide cross-training between arborist staff and concrete inspection staff so that either inspector may inventory situs or tree data, mark² concrete damage, and communicate with the public regarding tree-related concrete damage.
- ❖ Develop and update standards, specific criteria, guidelines, and checklists for use by tree and sidewalk inspectors to minimize subjective ratings and to provide maximum risk management coverage.

² In this context, "mark" means to use spray paint to indicate where repairs are to occur on concrete sections.

- ❖ Provide inspectors with automated field data collectors (e.g., PG&E meter readers), which can be used to inventory site data. Such a system can provide an "electronic checklist," for the inspector (thereby minimizing subjective ratings), and can be downloaded into a PC-based work management system at the office. Once field data has been downloaded, the work management system can organize work, schedule follow up activities, and prepare appropriate letters and notices for property owners.
- ❖ Provide cross-training between arborist staff and utility inspection staff so that either inspector may inventory utilities and tree roots, identify sewer line damage, and communicate with the public regarding tree-related utility damage.

Operations and Planting Procedures

- ❖ Select species with low tendencies for concrete damage and underground utility damage.
- ❖ Select healthy and properly developed plant material. When possible, contract grow trees for improved quality.
- ❖ Monitor and test soils, for horticultural suitability, prior to planting - some soils may require special physical modification.
- ❖ Modify soils to promote adequate drainage and aerification in those areas you wish root development to occur.
- ❖ Encourage root development in target zones by providing a deep-aerated zone (by using a trencher, backhoe, or auger to loosen and aerate the soil in the target zone).
- ❖ Encourage deep rooting through proper pruning, fertilizing, and watering.
- ❖ Locate and install plants to minimize future underground utility damage.

How to Use This Plan (Index)

The Streetscape Master Plan has been organized to provide basic background, recommendations and guidelines for streetscape design, installation and maintenance throughout the City of Milpitas. As such, it is intended to be used by a large and diverse audience including residents, homeowners, business owners, commercial land owners, private developers or designers of private projects, contractors and city staff. The Master Plan provides in-depth discussion and background on significant issues and principles related to the Milpitas streetscape. The Master Plan focuses on seven areas:

- 1) Street plantings such as street trees, median planting areas, planting areas, parking strips, plantings on sound walls, and understory plantings
- 2) Private development streetscape considerations
- 3) Gateways and entries
- 4) Streetscape amenities including art features, bus stops, lighting and furniture (benches, trashcans etc.)
- 5) Irrigation and use of recycled water
- 6) Streetscape maintenance
- 7) Coordination with other programs and public awareness

A series of tables provide a systematic guide to the use of the plan for the key audiences.

Guidelines are provided on the basis of the audience type or user groups and typical questions that each audience might pose.

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City Planning and Engineering Staff

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CIP Preparation (Capital Improvement Program)	Estimating Capital Costs Unit Costs	Page 61 Page 62

City of Milpitas

Streetscape Master Plan

Introduction and Purpose of the Master Plan

A. What is a Streetscape

The first image that usually comes to mind when the term streetscape is used are street trees. But streetscapes also cover other elements that create a pleasant desirable street scene. The most easily identified streetscape features include street trees and other landscaping in sidewalk cut outs, parking strip plantings (the narrow areas between the curb and sidewalks), right-of-way easements (the often wider areas between the back of sidewalks and private property lines), medians¹, city gateways and entries into the city from major streets, roads and freeways. However, neighborhood places such as plazas, mini-parks along city streets, and trails where amenities such as “street furniture” (benches, trashcans, etc.) or public art are located are also a part of the city streetscape. Less obvious streetscape features include bus stops and their associated amenities such as shelters, benches and informational signs. Functional elements such as soundwalls and planting associated with right-of-way walls or fences, as well as the irrigation systems and drainage systems used to maintain the streetscape areas are all considered a part of the streetscape.

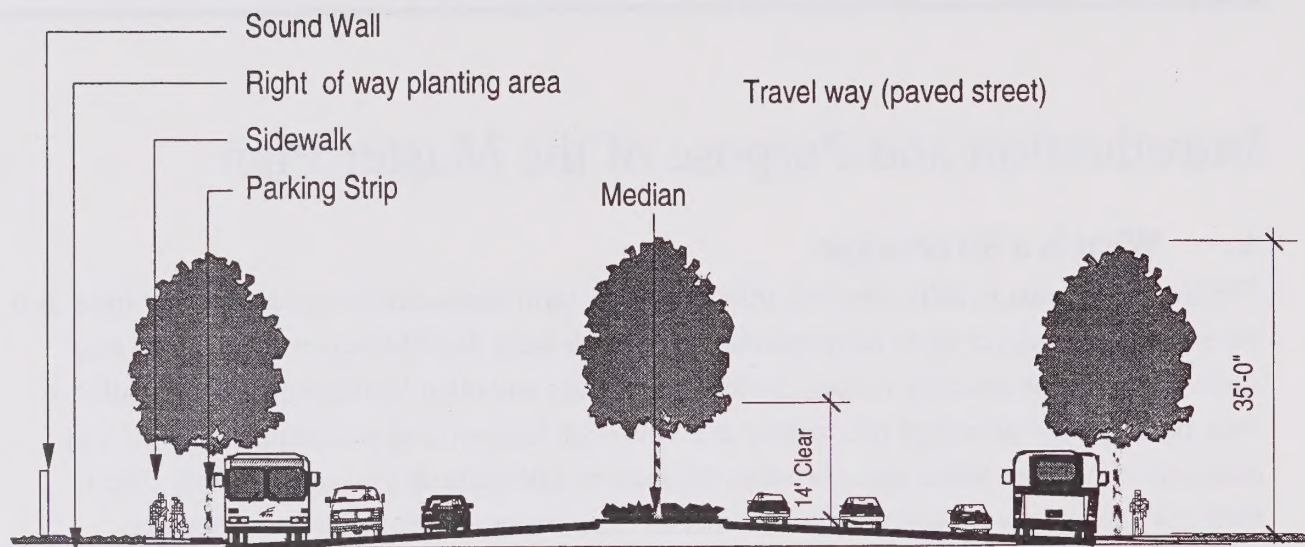
B. What are the benefit of streetscape improvements?

Trees, landscaping and other streetscape features represent major capital assets in our cities. Like the streets, sidewalks, sewers and buildings, these features are a critical and valuable component of the City of Milpitas infrastructure. Trees and other plant materials are one of the few capital investments which increase in value over time. Studies have shown that street trees have measurable economic returns in the energy they save by cooling hot cities, as well as increasing the humidity and reducing glare.² Streetscape improvements not only make cities beautiful but are good for the public’s physical and mental health. Trees and other plants used in streetscapes filter dirt, ash, pollen and smoke that can damage human lungs. They also absorb carbon dioxide and other gases and in turn replenish the atmosphere with oxygen.

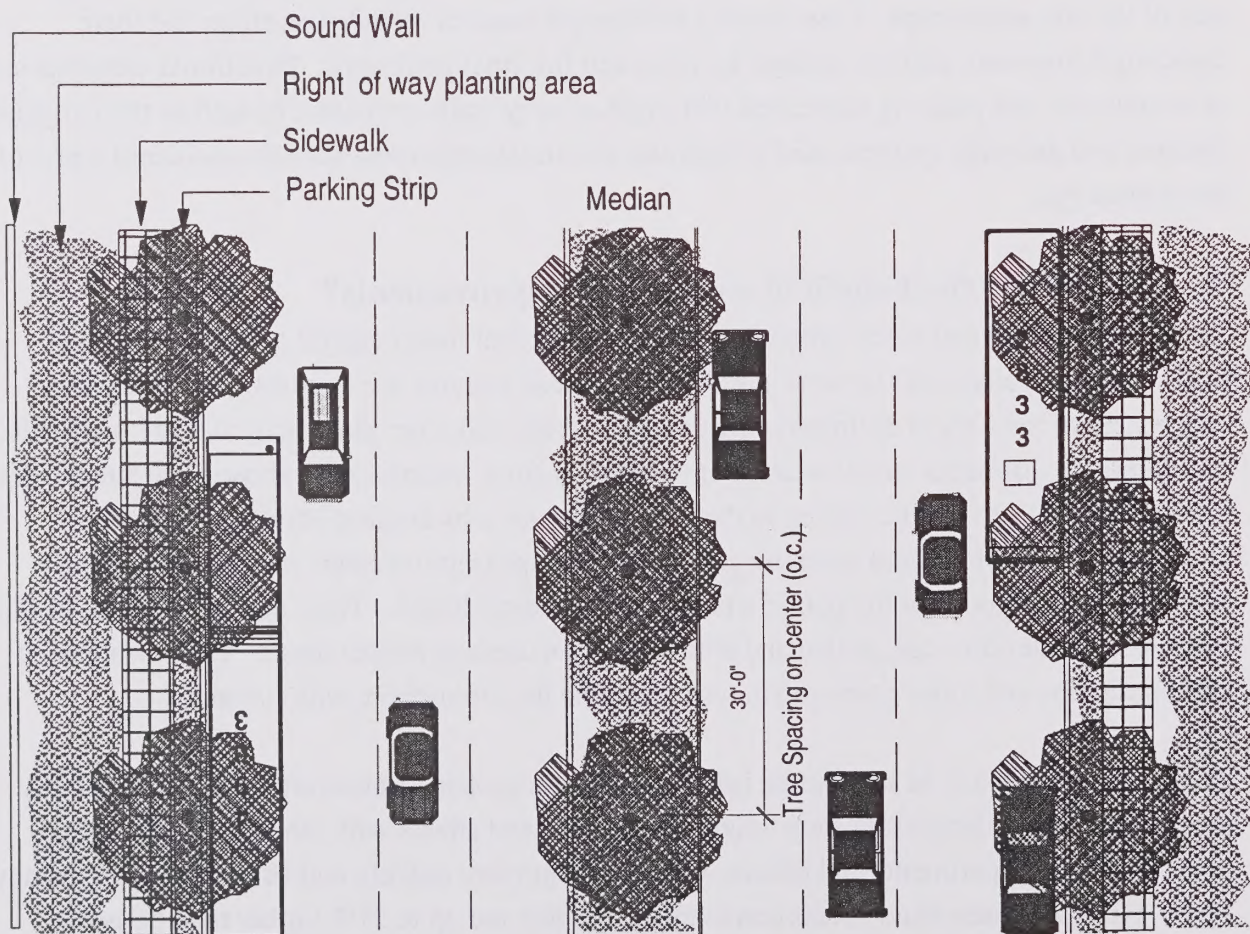
The positive influence of streetscape improvements on property values and economic stability are varied. People linger and shop longer along tree lined streets with amenities that support pedestrian use. Apartments and offices with trees rent more quickly and have higher occupancy rents. Houses on tree lined streets command prices that are up to 21% higher than houses in

¹ Figure 1 depicts in section and plan layout the terms typically used to discuss streetscapes.

² Studies include: United State Environmental Protection agency, Cooling our Communities, January 1992; Our City Forest, The Endangered Forest, 1993.



Section



Plan

Figure 1. Anatomy of a Streetscape

City of Milpitas Streetscape Master Plan

more barren areas. Industrial sites that include mature trees are in greater demand and are more valuable to rent or sell.

Streetscape improvements can have positive benefits to the natural environment. The reduction of paved areas with landscape treatments can increase ground water recharge, as well as reduce the amounts of grease and oil transported to streams. They can help slow surface run-off from storms and reduce soil erosion and sedimentation of streams. Select tree species can help create habitat and food for birds and animals. Improvements may also be designed to create special conditions to protect threatened plants that would not otherwise exist in an urban setting.

C. The Status of California Streetscapes

While the benefits of streetscapes are becoming more widely recognized, the state of our urban forests in California is declining. Three statewide comprehensive surveys of California cities and counties were sponsored by the California Department of Forestry and Fire Protection. These survey findings were published for the years 1988, 1992, and 1997. The 1997 California and Urban Forestry Survey released in July 2000 identified the following significant issues regarding municipal tree programs:

- Planting of trees in urban areas continues to be a significant achievement, especially by volunteer groups, the aging urban forest results in 25% more trees removed than planted, as compared to 18% in 1988 and 1992.
- The species favored for planting tend to be smaller, and shorter-lived providing fewer of the benefits that trees offer in urban areas. This selection is driven heavily by the lack of space for planting due to concerns over interference with utilities and long-term maintenance costs.
- Cities continue to be the group that maintains trees, while developers are the ones who pay for and plant them. Residential homeowners are decreasing in the role in three areas. "Ownership" of trees by other sectors needs to take place, especially by homeowners.
- There has been an increase in urban and community forestry programs funding since 1992, averaging a little over \$5 per resident. Funding is strongly related to overall economic strength since over 70% of the funds for these programs come from the city's general funds.
- Increasingly Urban and Community Forestry programs are aligning more with Parks and Recreation divisions in cities rather than Public Works.
- The tremendous volume of "greenwaste" from tree trimming and removals is increasingly seen as a resource value rather than a cost. Around 20% of the cities utilize these raw materials for solidwood products like lumber, and specialty products. Other uses include chipping for mulch, energy and firewood use.

City of Milpitas Streetscape Master Plan

- Standards for pruning trees continue to be emphasized. Over 90% of the Urban and Community Forestry employees are certified according to some professional standard, usually the International Society of Arboriculture.
- More programs are investing in inventories of their urban forests helping to reduce costs through improved planning.
- Though the trend in tree ordinances continues, their effectiveness is not consistent for all types of provisions. This is especially true of tree planting which must be seen as a long-term commitment to protecting trees on private property.
- Urban and Community Forestry programs can provide significant reductions in the hazards that trees can create, improve real estate values, stimulate growth in business, enhance civic pride, and improve air quality. However, these benefits need to be translated into funding returns in order to maintain this significant investment in city-infrastructure.

D. Purpose of the Plan

The Streetscape Master Plan is a planning document that addresses the major issues related to street trees, landscape treatments and amenities in the public street right of ways. The Master Plan provides overall guidelines and recommendations. It gives examples using several potential projects in order to further explain the guidelines. It also identifies potential programs, additional inventories and policy issues for future consideration.³

The Master Plan is designed to be a tool used by Milpitas citizens, special interests groups, policy-makers, developers, designers and city staff to move towards improving the visual and pedestrian quality of streets. The Master Plan is meant to provide a framework that can effectively guide streetscape development and maintenance over the next twenty years. It should be used in conjunction with other city master plans, such as the Trails Master Plan, Mid Town Specific Plan and development policies.

The Master Plan was developed through an inclusive process working closely with the Streetscape Master Plan Task Force representing the Planning Commission, Citizen's Advisory Committee, Parks, Recreation and Cultural Resources Commission, Bicycle Transportation Advisory Commission, and the Vision Corridor Committee. City staff formed a Technical Support Committee including representatives from the City Manager's Office, Community Services, Public Works Engineering, Planning, Traffic, Finance, Recreation, Police and Fire Departments.

³ The Master Plan does not provide a street by street analysis of existing street trees, nor other streetscape amenities. It does not make final selection of street improvements projects or street tree plantings. These final selections will be made during design development on a project specific basis using the guidelines presented in this plan.

Street Plantings

A. Goals and Strategies for Street Plantings

Goal 1.1

Provide a comprehensive set of design guidelines and parameters for street tree and landscape planting in public right of way areas. Establish a hierarchy of design elements related to functional components that address commercial, residential and industrial areas, parking strips, median islands and sound wall treatments.

Strategies

- 1.1.1 Establish planning and design criteria based on adjacent land uses, traffic volumes, existing and future infrastructure conditions, appropriateness of environment and horticultural principals.
- 1.1.2 Establish prioritization criteria for new tree planting efforts and areas to be rehabilitated.
- 1.1.3 Promote establishment of well designed plantings along major thoroughfares.

Goal 1.2

Provide city staff, property owners, developers and neighborhood groups with the information needed to select specific tree species for specific streets, neighborhoods or streetscape conditions. Create standards for the planting of new trees that will enhance the city environment, aesthetics, commercial, industrial and residential property values, provide climatic enhancements and mitigate undesirable pollution.

Strategies

- 1.2.1 Develop guidelines that provide information needed to select specific tree species for specific neighborhood or streetscape conditions.
- 1.2.2 Refine the Approved Street Tree List to identify additional species and cultivars well adapted to local site conditions (both cultural and environmental) that address the street tree and landscape planting situations within right of way areas, drought tolerance and disease resistance. Periodically review and update.
- 1.2.3 Recommend that the trees on the Approved Street Tree List be designed into new projects or replacement of existing trees.

- 1.2.4 Provide for opportunities to plant experimental species and new cultivars to evaluate their performance as street trees and landscape materials.
- 1.2.4 Encourage the continued taxonomic and horticultural diversity of the urban forest through variety of street trees and landscape plantings to reduce widespread insect and disease problems and promote sustainability.
- 1.2.5 Encourage selection of large-scale trees along major corridors to improve climatic conditions and provide an impact on the large-scale streets.
- 1.2.6 Encourage planting of regional native trees and those from areas with similar conditions for increased habitat value and adaptability to local conditions.
- 1.2.7 Promote and prioritize planting along all established streets that lack plantings.
- 1.2.8 Develop a methodology to coordinate street tree and landscape plantings with infrastructure, traffic requirements and capital improvement projects.
- 1.2.9 Strengthen enforcement of proper tree design, installation and maintenance by all outside contractors working within the street right of way.
- 1.2.10 Evaluate tree purchasing through contract growing with commercial nurseries or publicly sponsored programs to reduce costs and ensure availability of quality nursery stock that meets the specifications for street tree planting and landscaping.

B. Planting Guidelines by Street Types

B1. Prioritizing Streets for Tree Plantings and Streetscape Enhancements

In prioritizing streets for new street tree plantings, or replacements of landscape materials, consider the following items:

- Prominence of street/ planting location in city hierarchy. Key streets such as arterials or collectors shown in Figure 2 should receive higher priority over local streets.
- Existing condition of street trees. Streets with no landscaping or poor landscaping should be given higher priority. Develop an inventory and assessment program of existing street tree plantings to identify street trees for removal and replacement projects.
- Joint projects. Projects such as planting new street trees when the streets and sidewalks are being repaired or during undergrounding of overhead utilities should receive priority. Other types of work proposed in right of way may include undergrounding of overhead utilities, road widening, repaving and sidewalk replacement.



Figure 2. Key Streets

- Available funding and scope of project. Street tree plantings and other streetscape enhancements will be phased over a number of years. The amount of required funding and the scope of project need to match available funds and a logical progression of streetscape improvement implementation. Projects that can be funded with matching grants or other means that leverage available city funding and meet multiple goals should be given priority.

B2. Species Selection¹

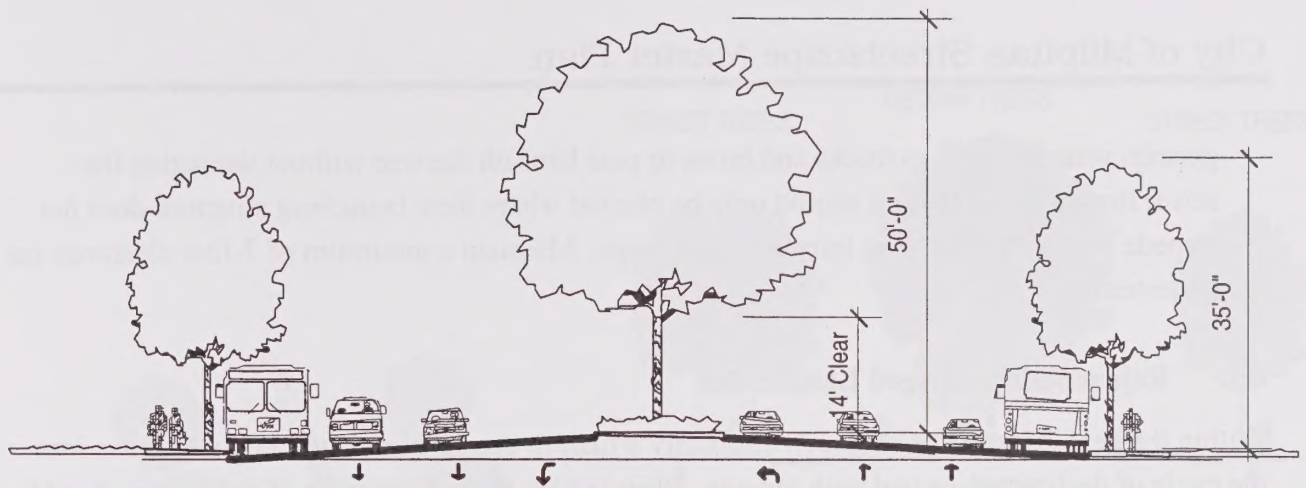
- Size of Tree: The dominant tree species selected should be large enough to provide a significant visual impact appropriate to the scale of the street. Smaller trees may be appropriate accents, but tend to get lost in the busy street scene unless planted in groupings.

Arterial and collector streets: Major streets are typically wide with four to six lanes of moving traffic. Trees used along these streets should be large spreading trees that would help humanize the scale of the wide travel way and provide a pedestrian friendly environment for the adjacent sidewalks. The impact of tree size and its shape on the overall streetscape can be seen in the Figure 3.

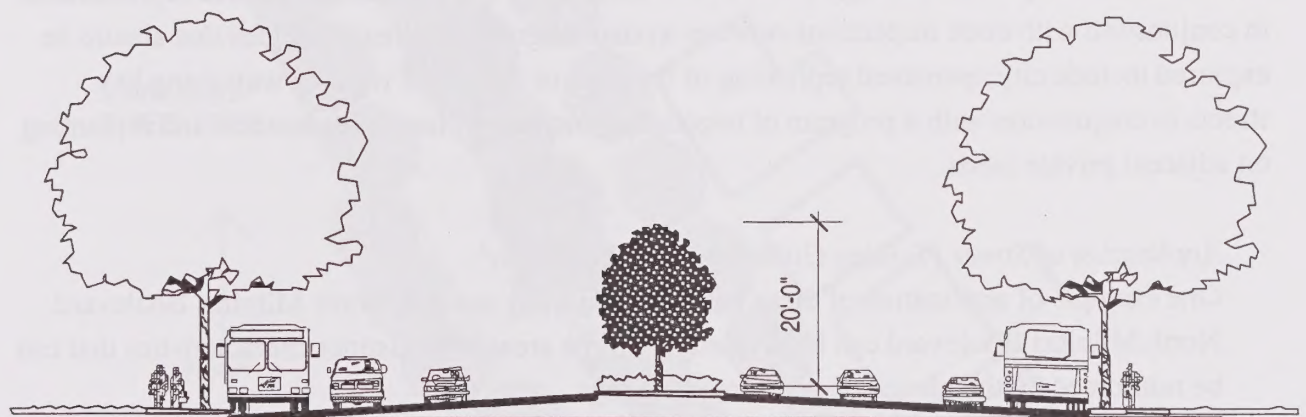
Local Streets: The narrower neighborhood streets, typically two lanes, should also use a dominant species to have a significant visual impact. If the goal is to create a shaded, tree lined street (with the traditional canopy coverage of trees touching adjacent trees), large spreading trees should be utilized. In some neighborhoods overhead utility lines and/ or restricted right-of-way will limit the species selection to a shorter and overall smaller tree.

- Growth Rate: Trees should be moderate to fast growing. This allows the tree to rapidly reach sufficient height and trunk size, resist vandalism and provide the desired tree cover. The initial planting size depends upon available funds. Smaller trees develop healthier root systems and overall growth patterns; however, a larger initial size often reduces vandalism to the tree. Slow-growing trees are appropriate in landscape settings where other trees or landscaping can provide an immediate impact while slower-growing trees develop.
- Branching Structure and Clearance Below Trees: For trees that grow over the street travel ways, the tree structure must be such as to allow for pruning to create a minimum clearance of 14 feet to the first branch without damage to the overall appearance of the tree. This

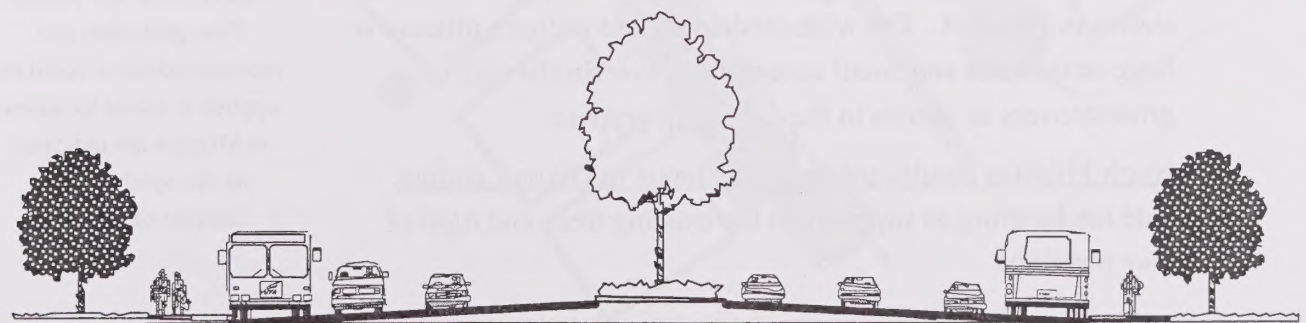
¹ Additional detailed information on selecting tree species can be found in Appendix 1.



Large Tree in Median - Medium Upright Trees at Parking Strip



Small Tree in Median - Large Upright Trees at Parking Strip



Medium Tree in Median - Small Flowering Trees in Right of Way

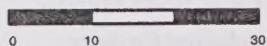


Figure 3. Impact of Tree Size & Shape on Streetscape

permits vehicles such as trucks and buses to pass beneath the tree without damaging the lower limbs. Smaller trees should only be planted where their branching structure does not impede pedestrians or hang into the travel ways. Maintain a minimum of 7-foot clearance for pedestrians.

B3. Rejuvenation of Aged Landscapes

Within the next 10 to 20 years, much of the city's mature tree plantings will begin to move into the cycle of decline associated with old age. Planning for the rejuvenation of those trees should include exploration of appropriate incentives (or penalties) for the plantings on private properties, especially commercial and industrial, that contribute to the street scene. It may be possible for the city to require rejuvenation of private landscapes when properties are sold or when there is a request for change in land use. Some cities track needed street tree replacements in conjunction with code inspections or water system upgrades. Other strategies that should be explored include city sponsored replanting of the trees in the public right of way along key streets in conjunction with a program of negotiating increased planting easements and replanting on adjacent private lands.

Application of Street Planting Guidelines to a Key Street²

One example of application of these guidelines to a key street is North Milpitas Boulevard. North Milpitas Boulevard can be divided into three areas with distinct characteristics that can be reinforced by the choice of street tree plantings.

- North Milpitas Boulevard from Jacklin to Calaveras. Remove existing small Evergreen Pears (*Pyrus kawakami*) and replace with new large-scale tree plantings that can visually unify the street. Street trees should be planted in larger tree pits with structural soil. A complete renovation of the median should include removal of the planter boxes and existing olive trees as shown in Figure 4. The wide median should utilize a mixture of large-scale trees and small accent trees, low shrubs and groundcovers as shown in the following graphic.
- North Milpitas Boulevard from city limits to Dixon Landing. Add landscaping to supplement the existing trees and right of way plantings.



Ideas of how the Master Plan guidelines and recommendations could be applied to actual locations in Milpitas are indicated by this symbol in the margins of the plan.

² Seven key arterial and collector streets were examined in greater detail during the development of the Master Plan. These are Piedmont Avenue, South Park Victoria, North Park Victoria, Escuela Parkway, North Milpitas Boulevard, West Calaveras Boulevard and East Calaveras Boulevard. Summary recommendations for these streets are included to provide examples of how to apply the guidelines.

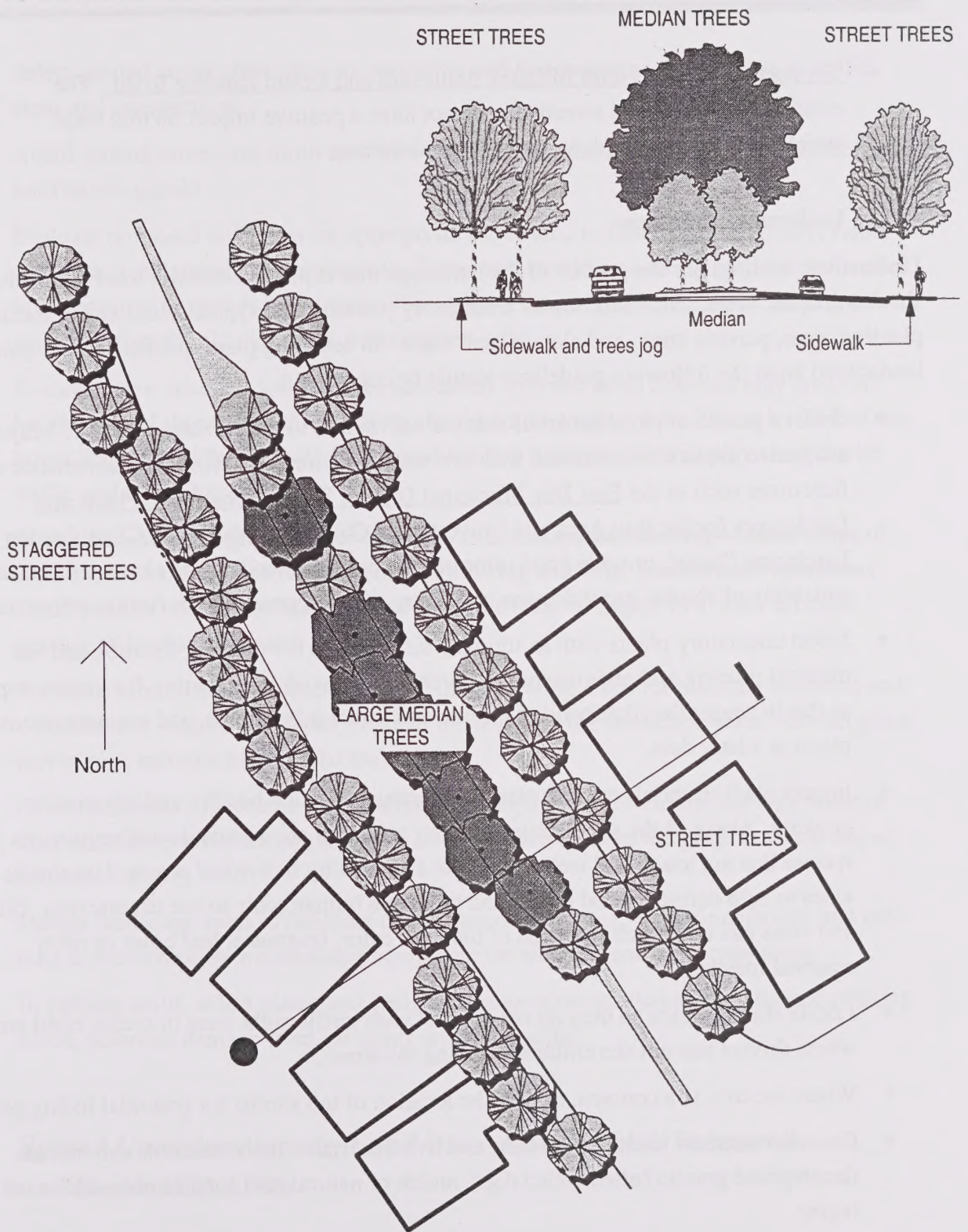


Figure 4. North Milpitas Boulevard

- Commercial area at North Milpitas Boulevard and Dixon Landing Road. The existing magnolias and sweetgums do not have a positive impact on this wide street cross section. Replant with a large-scale tree.



B4. Understory Plantings

Understory plantings are the portion of the landscape that is planted beneath trees and includes shrubs, groundcovers, vines and lawns. Understory plantings are typically utilized in medians, planting areas, parking strips and along sound walls. In selecting plant species and designing the landscaped areas the following guidelines should be considered.

- Select a palette of plant materials that are well suited to the climatic region of Milpitas, adapted to urban environments, with low water requirements and low maintenance needs. Resources such as the East Bay Municipal District Water Conserving Plants and Landscapes for the Bay Area and University of California Water Use Classification of Landscape Plants³ provide good information for understanding the characteristics and suitability of shrubs, groundcovers and vines. (See Appendix 1 for further information)
- Select understory plants with an ultimate size that fits the planting location and has minimal pruning and maintenance requirements. Avoid overplanting for instant impact as this increases the likelihood of disease and insect infestations, and requires removal of plants at a later date.
- Inspect plant materials prior to planting to ensure they are healthy and vigorously growing. Many of the streetscape locations are harsh environments and require not just species that are tough and well suited, but also healthy individual plants. Use shrubs and vines to help define special places and provide a human scale to the streetscapes. Shrubs and vines can add a rich selection of blossom color, fragrance, leaf color or other seasonal interest.
- Locate shrub masses so they do not conflict with traffic sight lines or create blind areas where drivers can not see children crossing the street.
- Where security is a concern, review the location of tall shrubs for potential hiding places.
- Groundcovers can include both inert and live materials. Inert materials can include decomposed granite (often called d.g.), mulch or natural duff such as redwood or oak leaves.

³ The Water Use Classification of Landscape Plants (WUCOLS), 1999 edition is available through the Internet at www.dpla.water.ca.gov/urban/conservation/landscape/wucols.

- Select ground cover plants that are spreading and low maintenance adjacent to traffic areas and intersections.
- Avoid ground cover and shrub species with thorns or branching patterns that collect and hold blowing trash.
- Evaluate proposed lawn area for appropriate use related to functional suitability, visual quality and maintenance requirements. Grass mix should be a hardy turf mix well suited to the specific project requirements. The size and shape of lawn areas and irrigation system design should maximize water conservation.
- Evaluate lawn areas for safety issues associated with use as an informal play area. A helpful rule of thumb is that lawn areas should not be smaller than 20 foot by 20 foot nor larger than 50 foot by 50 foot. Large medians that become informal play areas can be traffic and safety hazards.
- Where lawn is used, group shrubs and trees to accommodate mowing. Linear strips of lawn should be evaluated for feasibility of mowing and other maintenance operations. Small patches of lawn are costly to maintain, difficult to irrigate in a water efficient manner and reduce the value to users.
- Provide a minimum of 2 inches of mulch in all planting areas for moisture retention and weed control. Identify all material under the mulch in the landscape plans. Do not place non-porous material beneath the mulch.
- Group understory plantings with similar water requirements. Group any high water or high maintenance demanding plants in areas where they have the greatest visual impact on pedestrians.
- Design landscape areas to facilitate maintenance operations. Provide curb cuts and pull-outs to accommodate maintenance equipment for medians and landscape areas.
- In parking strips, select plants and design irrigation systems that address limited planting space, potential damage from car doors and foot traffic.

C. Special Considerations by Land Use -- Commercial, Industrial and Residential Areas

C1. Commercial Areas

Commercial areas have special issues that must be considered when applying the guidelines for street tree plantings and other streetscape improvements. These include:

City of Milpitas Streetscape Master Plan

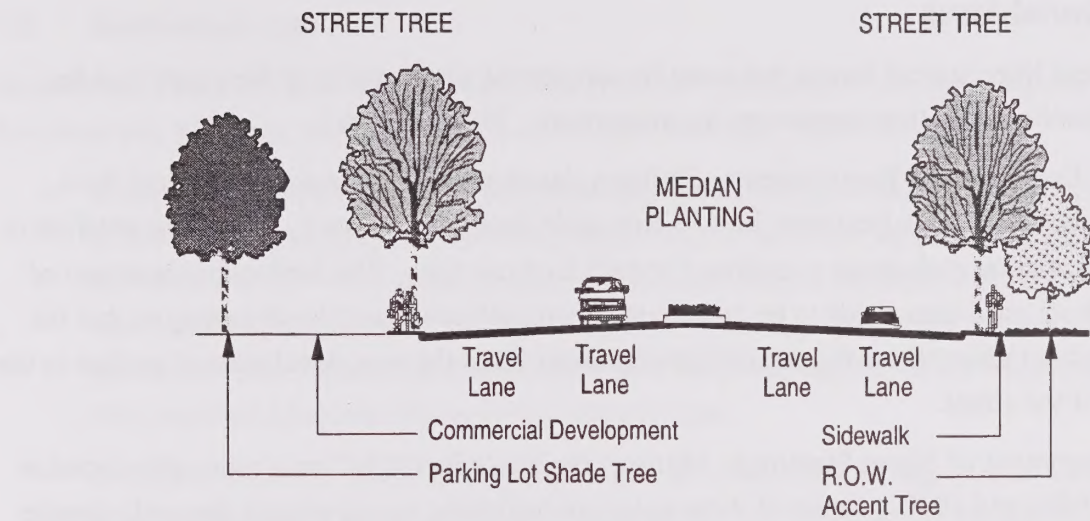
- Storefronts need visibility from the street. Use large trees that will branch above store signs and not block customers' views of storefronts from adjacent streets.
- Shopping centers with parking in front offer different conditions and should include trees and landscaping. Customize tree selection to reflect the surrounding land use and landscape treatments. Provide shade trees to reduce the impact of asphalt parking areas.
- Consider potential damage to landscape plantings from car doors in parking areas. Provide curbed planting islands that are an adequate size and located to protect trees in parking lots to protect from damage. Islands should be a minimum of 4 feet wide. Develop enhanced pedestrian environments with additional amenities such as benches, trashcans, signage and art features.
- Identify appropriate locations for smaller trees and bulb-outs provided they do not block traffic visibility.
- Provide for continuity of streetscape design within a single business district. A unified tree selection of one to three trees should be made for the length of a commercial area, rather than a block by block approach as in residential neighborhoods. Continuity of streetscape design is especially important in larger commercial areas such as the town center or historic district.
- Consideration of tree litter (leaf, flower, or fruit). Flowering and deciduous trees offer greater seasonal variety and interest, but require consideration of where their natural litter will end up. In sidewalk or parking areas where pedestrians are expected to walk, a commitment to a higher level of maintenance is required if such trees are selected

Application of Commercial Areas Guidelines to a Key Street

One example of an application of these guidelines to a commercial area is Calaveras Boulevard. Calaveras Boulevard can be divided into two areas with distinct characteristics:

- West Calaveras Boulevard from I-880 to North Milpitas Boulevard has many commercial businesses adjacent to the street edge. New median planting should incorporate heritage trees, as well as smaller accent trees. Add more trees, shrubs and ground covers where needed in the existing planting areas on the embankment, where the boulevard crosses over the railroads.
- East Calaveras Boulevard from North Milpitas Boulevard to I-680 includes the town center shopping district adjacent to the street. Street trees are in good condition here. Focus on new median planting incorporating heritage trees, as well as smaller accent trees.





Street Section A

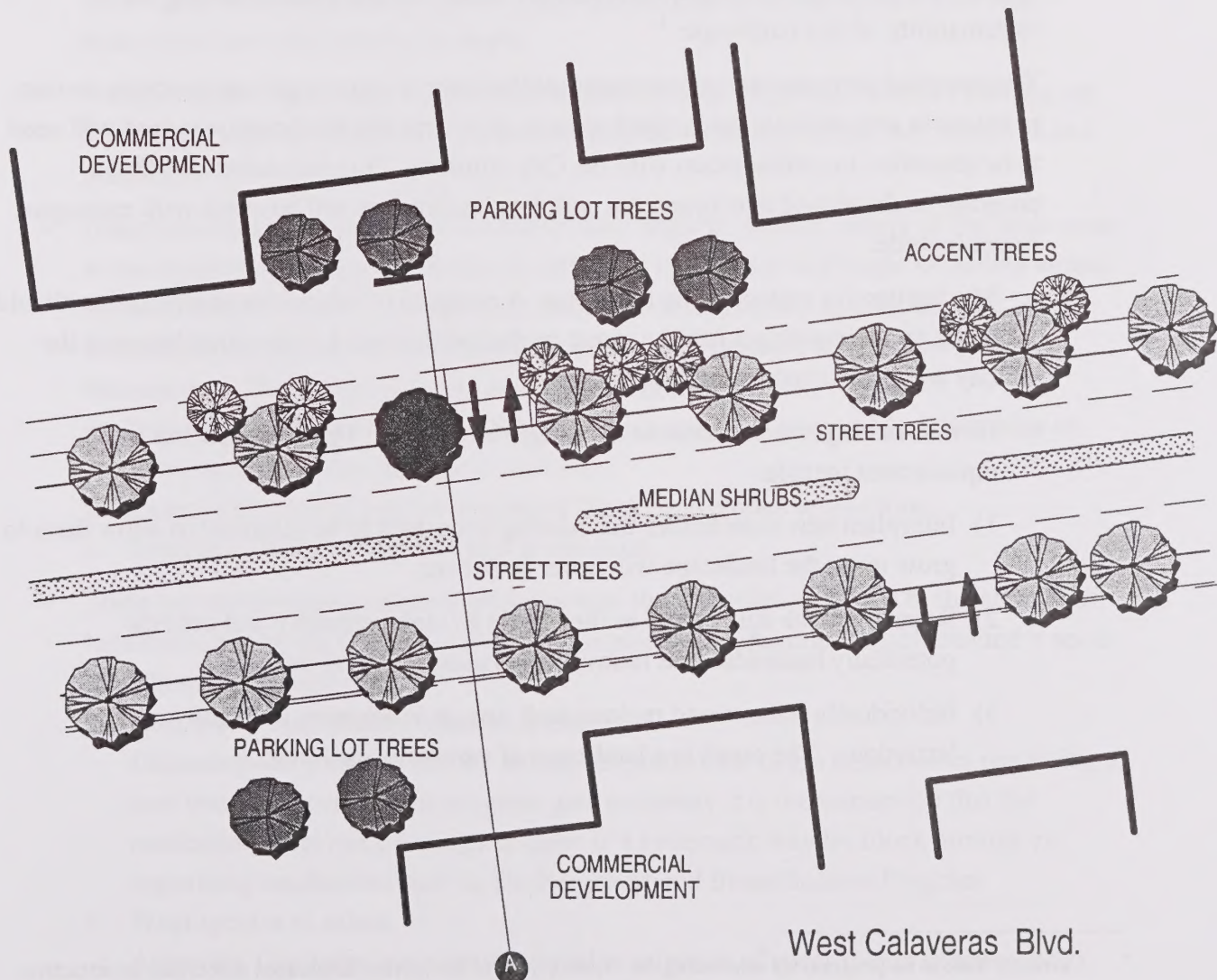


Figure 5. West Calavares Blvd Commercial Area

C2. Industrial Areas

Industrial areas have special issues that must be considered when applying the guidelines for street tree planting and other streetscape improvements. These include:

- **New Development Requirements.** Existing development requirements provide for a generous landscape treatment in a 35-foot wide front yard setback. These are detailed in the municipal code zoning sections for each land use type. The landscape treatment of this front yard area needs to be coordinated with adjacent street landscaping so that the streets in industrial areas have design continuity from the new development project to the rest of the street.
- **Management of Aging Plantings.** Many of the city's industrial areas were developed in the 1960s and 1970s. Some of these areas are beginning to experience the early demise of their fast growing landscape. New policies need to be adopted regarding the sustainability of this landscape.⁴

The potential planning and enforcement mechanisms to require private property owners to maintain and renovate landscaped areas to an acceptable landscape standard will need to be identified in collaboration with the City Attorney. It is recommended that a program be developed in conjunction with key landowners and business park managers. Issues include:

- a. **Mechanism for replacing the landscape.** A program of incentives and penalties should focus on maintaining a healthy street landscape through a partnership between the city and private industrial landowner
- b. **How to manage mature trees as they begin to decline.** Three approaches to replacement include:
 - 1) Interplant new trees before the existing trees need to be removed to allow them to grow up so the landscape will never look bare.
 - 2) Remove all the aging trees as they begin to look unhealthy and become potentially hazardous and renovate the landscape all at once
 - 3) Individually remove and replace each tree, as it becomes unhealthy and/or hazardous. The result is a landscape of variously aged trees.

⁴ Currently there is no program for renovating the "front yards" of the private landscapes that create an attractive street scene in the industrial areas of Milpitas.

C3. Residential Areas

Residential areas also have special issues that must be considered when applying the guidelines for street tree plantings and other streetscape improvements. These include:

- Trees on streets near schools are especially susceptible to vandalism. Extra protection such as metal tree guards or planting larger sized trees (such as a minimum of 24" box tree with a 1 1/2" – 2" caliper trunk) may be warranted. The best protection is an active involvement program with the school children and neighbors in the planting and care of the street trees. Trees near schools also need to be selected to have a branching pattern that provides adequate clearance for school buses.
- Consider hill areas and protection of views. In hill areas, it is important to work with the adjoining property owners to identify appropriate tree sizes and locations to protect the view rights of the adjacent property. Early planning can prevent the need for future removal or law suits relating to views.
- Energy conservation, such as the use of deciduous trees to provide summer shading yet let sunlight into the houses in the winter, should be evaluated in final tree selection and placement.
- Determine how to manage mature trees as they begin to decline. Many of the street trees in the residential areas were planted in 1950's to 1960's and will begin to decline within the next 10 to 20 years. A program of incentives and penalties should focus on maintaining healthy street trees through a partnership between the city and private homeowner. Three approaches to replacement include:
 - a. Interplant new trees before the existing trees need to be removed to allow them to grow up so the street will never look bare.
 - b. Remove all trees in a given number of blocks and replant at one time.
 - c. Replace each individual tree as it is removed.
- There are several design issues that are unique to residential areas due to the number of homeowners. As the residential street tree replacement program is implemented it needs to address issues such as:
 - a. How many trees must be planted at once.

Ultimately the program may be able to respond to the single homeowner requesting a new tree. However, as the program gets underway it is recommended that the residential street tree plantings be done in a systematic way by block through an organizing mechanism such as the Neighborhood Beautification Program.
 - b. What species to select.

Appendix 1 includes more detail related to selection of specific tree species. It is recommended that the homeowners/neighborhood groups select from the plant list for

trees for their block. No more than 2 tree species are recommended per block. Visual diversity of neighborhood areas is improved by the harmonizing effect of a unified tree planting.

c. Where to plant.

In neighborhoods requesting street trees, the city should develop a program for acquiring planting easements in front yards for those areas that do not have a planting strip or other space for street trees.

Application of Residential Areas Guidelines to a Key Street

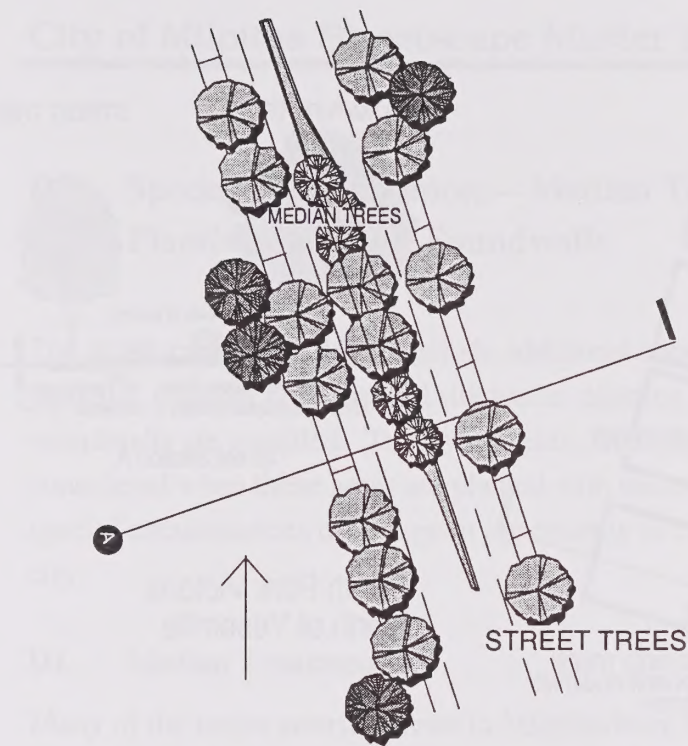
- Piedmont Avenue: Piedmont Avenue serves as an important eastern boundary of the city's valley floor. It has various landscape treatments throughout its length, but does not have street trees on the west side. New planting areas on the west side should reflect the avenue's role in the city by using large-scale trees with a native or rural character, such as deodar cedars (*Cedrus deodar*) or redwood (*Sequoia sempervirens*). Infill or replacement plantings in areas that are currently landscaped should reinforce the existing blocks of trees (magnolias, peppers, and mixed oaks/natives in wide median). 
- South Park Victoria: In general, the street should have additional magnolia trees planted to create a more regular spacing that reinforces the existing magnolia trees lining the street. New irrigation systems in the parking strip would help the new and existing trees grow at a faster rate and make a stronger impact on the street. South Park Victoria is a wide street with a variety of conditions along its length as shown in Figure 6 and 7. It serves as a good example of how to evaluate for removal of excess pavement to provide more planting spaces in medians or new planting strips so that trees can make a better visual impact. 

Near East Calaveras, South Park Victoria has a commercial area with a striped median. This median could be modified to accommodate a new planted median. Additional trees may be able to be planted on adjacent properties by working with the adjacent businesses owners. 

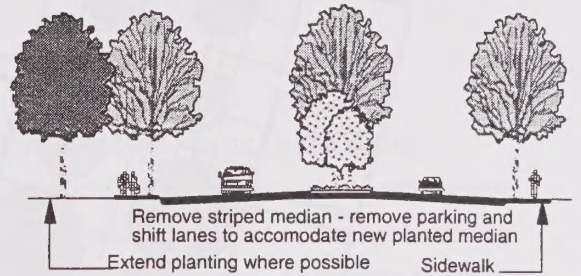
Near Canton where there is less demand for on-street parking, evaluate the potential to remove the parking and add either a wider planting strip or a central median. 

North of Yosemite, evaluate the traffic volumes to consider removing or narrowing travel lanes. This would then allow new planting strips while maintaining parking. 

South of Yosemite, where houses typically face the adjacent streets, consider widening the planting strips for portions of the streets. 

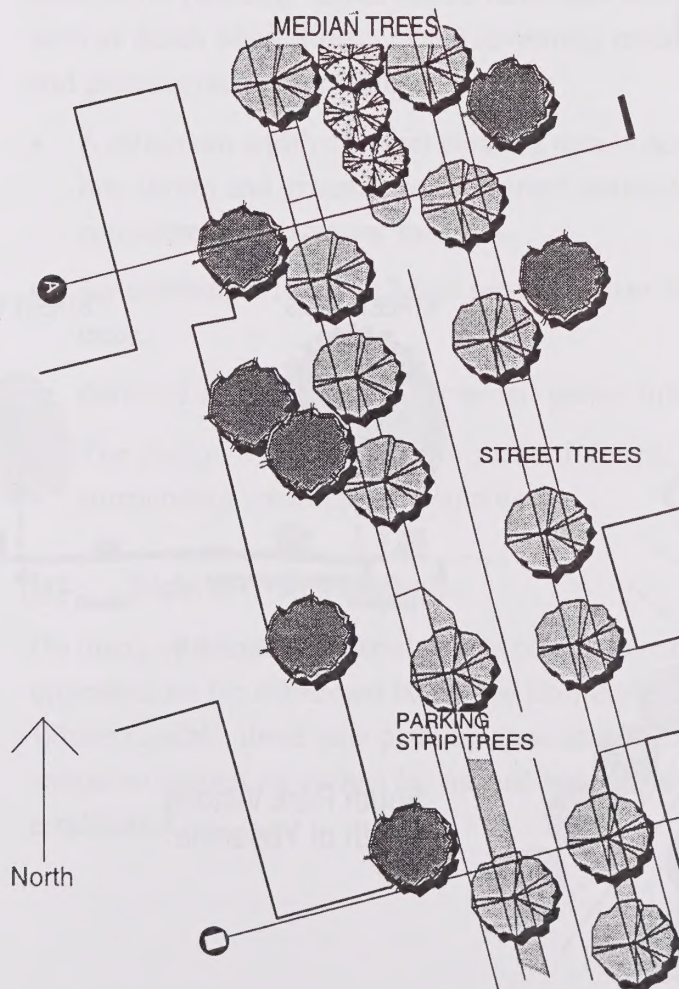


STREET TREES MEDIAN TREES STREET TREES

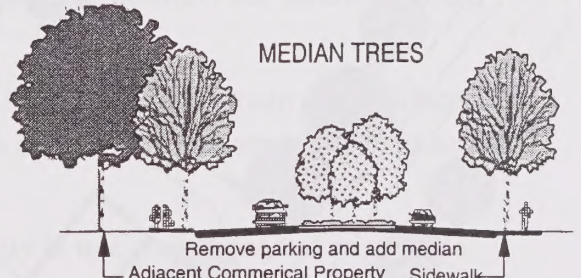


Street Section A

South Park Victoria
Near East Calaveras

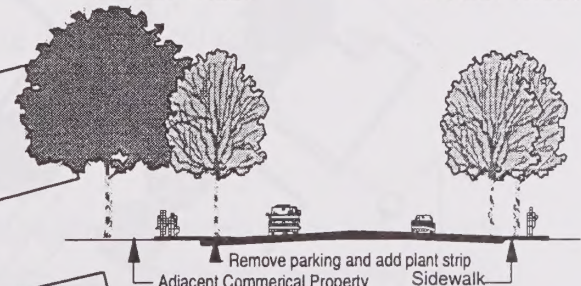


STREET TREES STREET TREES



Street Section A

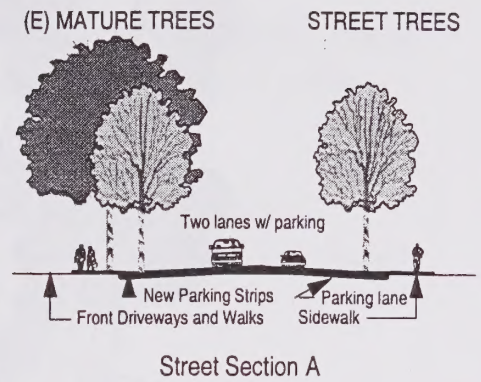
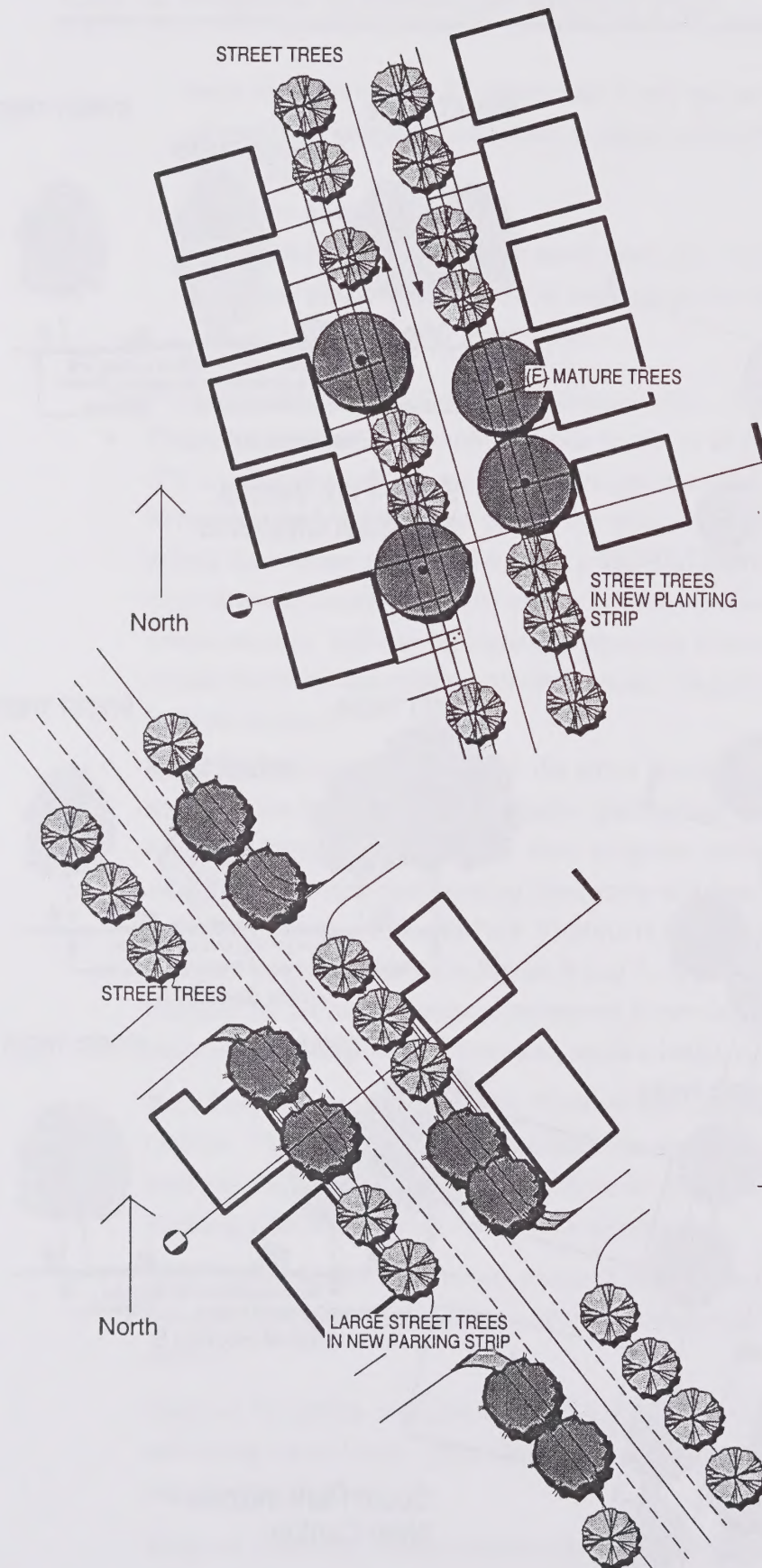
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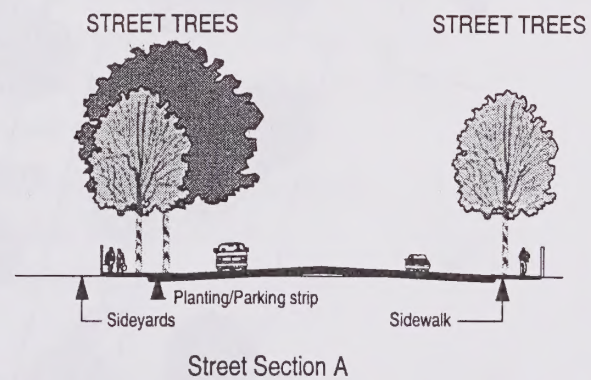
Street Section B

South Park Victoria
Near Canton

Figure 6. South Park Victoria



South Park Victoria
North of Yosemite



South Park Victoria
South of Yosemite

Figure 7. South Park Victoria

D. Special Circumstances -- Median Treatments, Planting Areas, Planting Strips, & Soundwalls

The streetscapes of Milpitas include additional opportunities for landscaping in the street medians, planting areas behind sidewalks, planting strips adjacent to the curb, and in areas where soundwalls are installed. Traffic visibility, street lighting, personal safety and security should be considered when these areas are planted with trees, shrubs and groundcovers. However, these special circumstances offer a great opportunity to create pedestrian spaces as well as to green the city.

D1. Median Treatments

Many of the major arterial streets in Milpitas have medians that are currently landscaped or are suitable for planting. Other streets have been identified for developing new landscape medians, such as South Main Street. When reviewing median landscaping consider the following width and planting recommendations:

- A minimum width of 4 feet planting area is desirable for trees. Appropriate use of either, low shrubs and groundcovers, or inert materials (such as cobbles or pavement) should be considered for narrower medians.
- An optimum width of 12-foot median allows for variety in tree placement and large-scale trees.
- Parkway medians (14 feet or wider) permit informal planting placement and large-scale trees.
- The design of medians as a formal or informal planting scheme should relate to the surrounding landscape and land uses.

D2. Right of Way Planting

On many of the major arterial streets planting areas located behind the sidewalk or curb provide opportunities for additional landscape plantings. These areas vary in size and associated issues. Where feasible, these new planting areas should include connectivity to the city's automatic irrigation system, or budget for manual watering until drought tolerant plants are well established.

- Narrow right of ways. In narrow right of ways utilize sidewalk cut outs and a structural soil⁵ mix beneath new concrete sidewalk installations to maximize the root zone for healthy tree development. In areas of existing sidewalks, evaluate the project feasibility to remove existing paving and replace with structural soil mix and new paving in conjunction with a replanting program. This type of solution may be well suited to areas such as North Milpitas Boulevard near Town Center Drive where it is recommended to remove the small evergreen pear trees (*Pyrus kawakami*) in existing small sidewalk cutouts and replace them with a larger tree (see Figure 4).
- New parking strips and sidewalk location. Where practical, a parking strip should be located between the curb edge and sidewalk to separate the sidewalk from the roadway. Use a minimum of 4-foot width for a successful parking strip. Wider parking strips are preferable and can incorporate shrub plantings and groupings of trees to create a boulevard effect where they do not interfere with parking and pedestrian access to parked cars.
- Other planting areas. Other planting areas within the right of way include areas back of the sidewalk where the right of way widens such as at major intersections. These wider planting areas provide the opportunity for pedestrian enhancements, such as benches that can provide a shaded area to stop and rest, and pathway lighting for safe passage at night.



D3. Existing Parking Strips

Narrow areas located between the curb and sidewalk called parking strips typically exist in residential areas throughout the city. In many neighborhoods they are well maintained areas with street trees and lawns. However, in other neighborhoods the planting strips have become eyesores from lack of maintenance, or have been modified with paving or large shrubs so they no longer are a part of the common street character. In most cases these areas are private property.

Weed abatement from the Municipal Code (Title V. Chapter 202) offers one tool that can be currently used if the landscape is seriously neglected.⁶ It is recommended that a proactive planting strip program be coordinated with Neighborhood Beautification Program to develop and inform the public about landscape maintenance standards. The potential planning and enforcement mechanisms require private property owners to maintain existing planting strips to

⁵ Structural soil is a scientifically designed soil mixture that can support pavement while providing a growing medium that allows for root penetration, water/ nutrients for healthy tree growth and adequate drainage. The three components of structural soil are crush stone, clay loam and a stabilizing hydrogel.

⁶ There currently is no policy or program for establishing a standard for planting strips.

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an acceptable landscape standard will need to be identified by the City Attorney. Washington Street between North Milpitas Boulevard and Escuela Parkway was identified as a good location for a pilot program. Potential improvements to the parking strip are shown in Figure 8.



Landscape standards should be established on a neighborhood basis. The issues are of local interest and will vary by neighborhood or portion of neighborhood location. Standards should include:

- Proactive incentives and enforcement of maintenance standards.
- Uniformity of treatment, especially of ground. Definition of acceptable inert materials (decomposed granite, packed earth mulch, rock), lawn, ground covers/shrubs.
- Removal and replacement of aged or hazardous trees.
- Approved tree species and development of uniform species or patterns throughout the neighborhood streets.

D4. Sound Walls

Sound walls protect neighborhoods from the busy traffic noise along many of the main arterials throughout the city. Most of these walls were developed in conjunction with the residential developments in the early 1960s and 1970s. The construction materials and techniques were typically wood frame with wood or stucco finish that has a limited lifespan. Many of these walls are beginning to deteriorate.

- An inventory of the legal ownership and condition of these walls should be completed. Once that information is gathered, staff can develop a replacement program for city owned walls and explore planning and enforcement mechanisms to require private property owners to maintain existing sound walls in good structural condition.⁷
- New or renovated soundwalls should have an attractive architectural character in keeping with surrounding area, or establish a pleasant character if one does not exist. The architectural character can be achieved through choice of material, finish, shape, texture, color, and pattern.
- The planting of trees, shrubs or vines is encouraged along existing walls that are devoid of attractive character for aesthetic and traffic calming purposes. Landscaping is critical in areas where the height of the wall exceeds eight feet, in order to reduce the apparent visual height of the wall.

⁷ The city does not have an adopted policy for soundwall development or renovation.

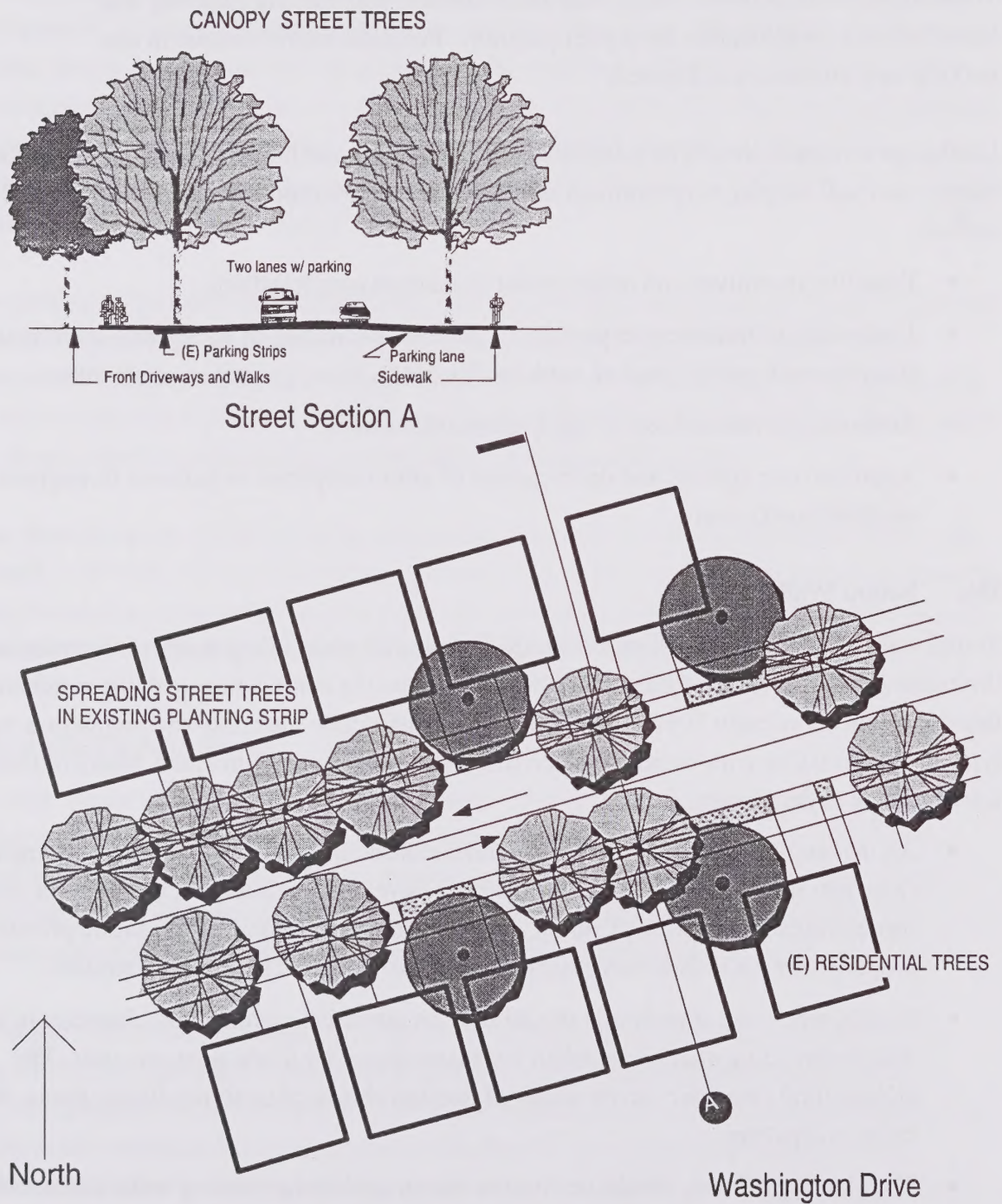


Figure 8. Washington Drive Parking Strips

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- New sound walls should provide for adequate planting areas and irrigation to support landscape to reduce their visual impact. The width of the planting area needs to increase proportionally to the overall wall height.

<i>Wall Height</i>	<i>Minimum planting width on each visible side</i>
0-8 feet	2 feet
8 -12 feet	4 feet
12 or over	6 feet

E. Coordination with Traffic & Utilities

Streetscape improvement planning and design must consider both traffic circulation and utilities early in the project.

E1. Coordination with Traffic and Traffic Calming Devices

- Streetscape improvements must incorporate the required setbacks and clear zones for adequate sight lines that are established for different speed limits and road classifications.
- Streetscape improvements must incorporate the required access and clearances for emergency vehicles, transit and trucks.
- Streetscape improvements, such as chokedowns⁸, can be designed as traffic calming devices to help slow traffic and make the streets safer for pedestrians.
- Throughout the city there are areas of excess pavement that could be dedicated to streetscape improvements and traffic calming devices. A few of these areas were identified during the Streetscape Master Plan planning process such as along South Main Street where painted medians could be curbed and landscaped, and along Mt. Shasta where chokedowns could be considered at intersections. In order to identify other opportunities, traffic volumes, adjacent land uses and levels of service (LOS) need to be reviewed. On a case by case basis the streets need to be evaluated to determine if the street cross section could be modified to add:
 - a. Parking lane tree pockets (especially to widen area at parking strips w/ existing trees).
 - b. New parking strips to provide separation between roadway and sidewalks.
 - c. Choke downs or bulb-outs at intersections.



⁸ Chokedowns, also called bulb-outs or neck-downs, are areas where the sidewalk has been widening into the parking lane of the street to create safer pedestrian street crossings, and allow additional space for streetscape amenities such as benches, streetlights, street trees and trash cans. They often occur on street intersections.

- d. Add space to existing parking strip or back of sidewalk plantings.
- e. Widen existing median.
- f. Create a new median.
- g. Create a new round-about as a traffic calming and landscape feature.
- Another area of coordination with traffic is the implementation of on-street bike facilities. Bike facilities and streetscape improvements often compete for the same limited left-over space in roadways. As projects are in the planning stage potential solutions should be explored for incorporating both landscape and bike lanes. Options may include:
 - a. Reduce median width.
 - b. Reduce width of the sides of right of way.
 - c. Reduce travel lane width.

E2 Coordination with Utilities

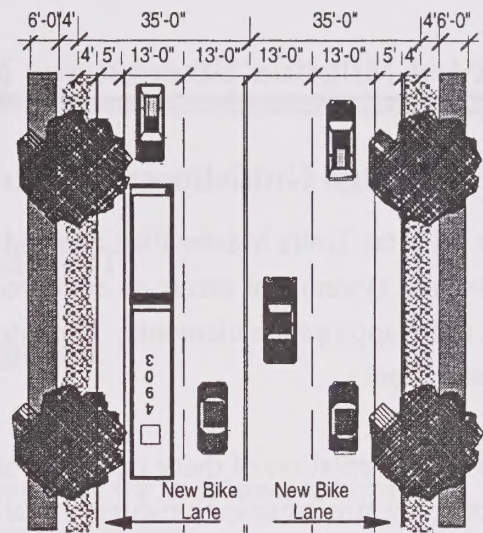
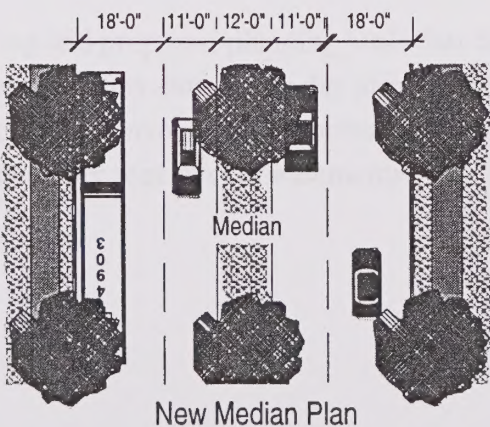
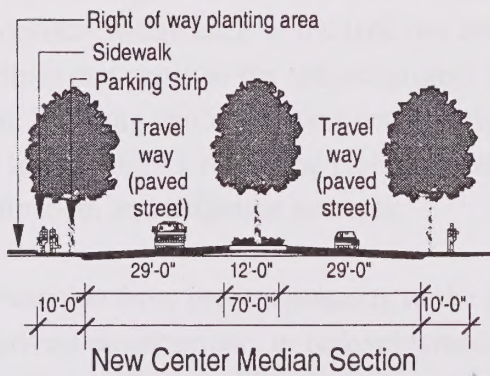
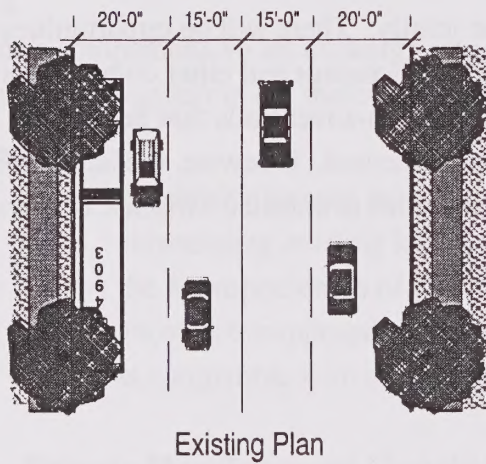
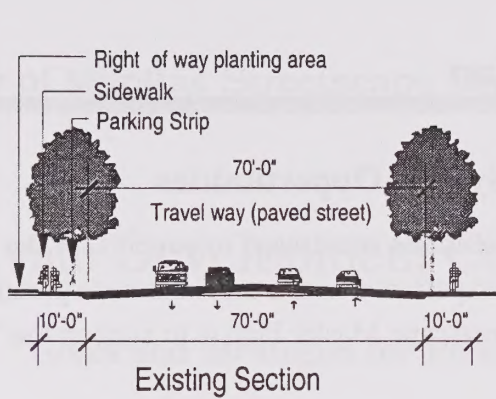
Overhead utilities offer a special challenge to streetscape improvements. Often the utilities are planned for future undergrounding. Three viable options should be explored for planting trees in these areas:

- Plant small stature trees whose mature height is lower than the utility wires
- Coordinate street tree plantings when wires are relocated underground. Coordinate funding for utility undergrounding and the planting of larger trees more suited to the street scene.
- Plant larger trees knowing that the overhead wires will be relocated before trees attain wire height.⁹

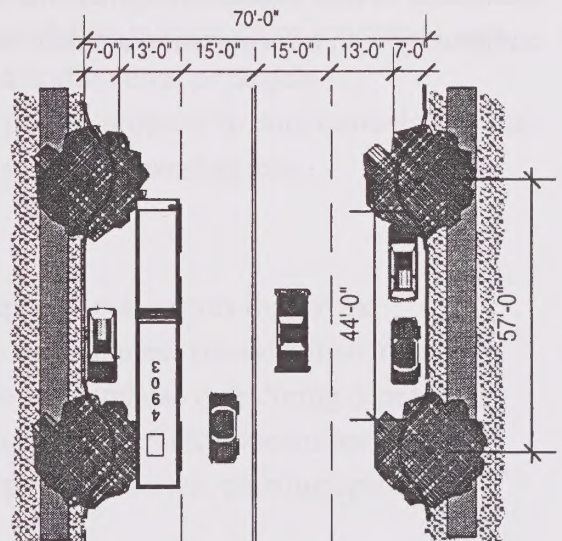
The installation of underground utilities such as storm drains, sanitary sewers, telephone, gas, and fiber optic conduits need to be coordinated when the streetscape improvements include tree plantings. Standards for planting over lines and minimum clearances from lines will vary with each utility. Five to ten feet is considered to be adequate clearance in most situations. When less than adequate clearance is available due to existing conditions, it may be appropriate to install tree root barriers to protect underground utilities and adjacent infrastructure. It is important to coordinate the final layout and design early in the project planning process.

Adequate street drainage and grading to storm drains offer a particular challenge when bulb-outs or sidewalk widening are incorporated into streetscape projects. The standard utility details in Appendix 2 offer viable strategies that should be considered in conjunction with the specific project site conditions.

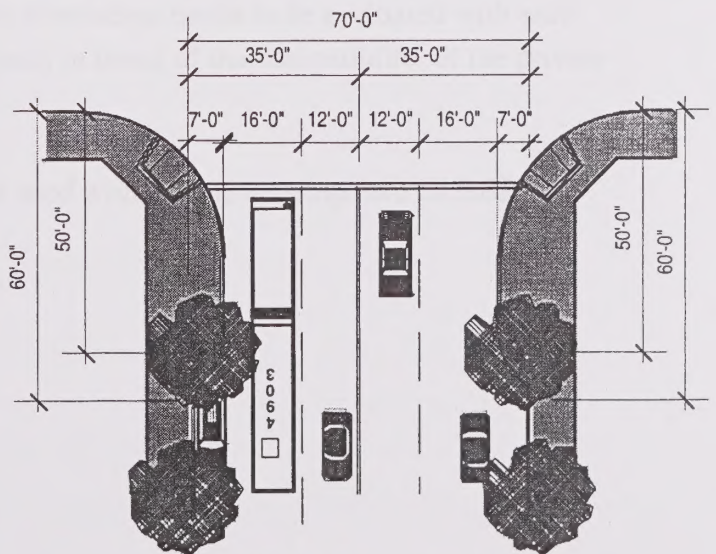
⁹ One drawback to this approach is potential damage to the tree's root system during the future undergrounding of the utility wires. This damage can be minimize if the utilities are installed by boring, or if the right of way permits the utilities to be underground away from the tree plantings.



Remove Parking or Travel Lane for
Bike Lane &/or Wider Parking Strip



Parking Lane Tree Planting Pockets



Chokdown @ Intersections Plan

Figure 9. Traffic Calming & Landscaping on Streets with Excess Pavir

F. Design Guidelines: Off Street Trail System Opportunities

The Milpitas Trails Master Plan adopted June 1997 identifies streetscape treatments for the off-street trail system that create an enhanced pedestrian experience with trees, landscape plantings and other appropriate elements. The intent of the Streetscape Master Plan is to support the Trails Master Plan.

The implementation of these two plans should be done jointly. There will be opportunities in developing streetscapes to recognize trailheads, safe street crossings and other components of the Trails Master Plan. The Trails Master Plan identifies many on-street trails that need to be incorporated as future streetscape improvements are implemented. Likewise, the landscape treatments of trail segments augment the streetscape amenities to enhance Milpitas as a livable community with transportation alternatives.

Private Development Considerations

A. Goals and Strategies for Private Development

Goal 2

Provide a comprehensive set of design standards and parameters for street tree, landscape planting and irrigation in the materials distributed to private developers.

Strategies

- 2.1 Establish planning and design standards based on proposed development use, surrounding existing land use, existing and future infrastructure conditions, and the appropriateness of environmental and horticultural principals.
- 2.2 Provide for appropriate transitions from private property to public streetscape that is compatible with the desired character of the surrounding area.

B. Private Development Considerations

The City of Milpitas Municipal Code identifies landscaping requirements for private development within each of the land use zones. Private development should utilize the design guidelines that apply to the subject project by street type and land use type during conceptual design. Planting and irrigation plans should meet or exceed the technical recommendations made in Appendix 1 regarding planting issues such as species selection, planting space, soil modification, and irrigation systems.

The transition from private property to the public streetscape needs to be evaluated with each new private development, or redevelopment project, in terms of the compatibility of the private landscape interfacing with street edge.

Existing and proposed planning tools that can be used with private development include:

- requirements during transfer of ownership;
- zoning ordinance requirements; and
- developer requests for easements.

Gateways & Entries

A. Goals and Strategies for Gateways & Entries

Goal 3

Provide guidelines to enhance the citywide gateways and develop a hierarchy of entry features.

Strategies

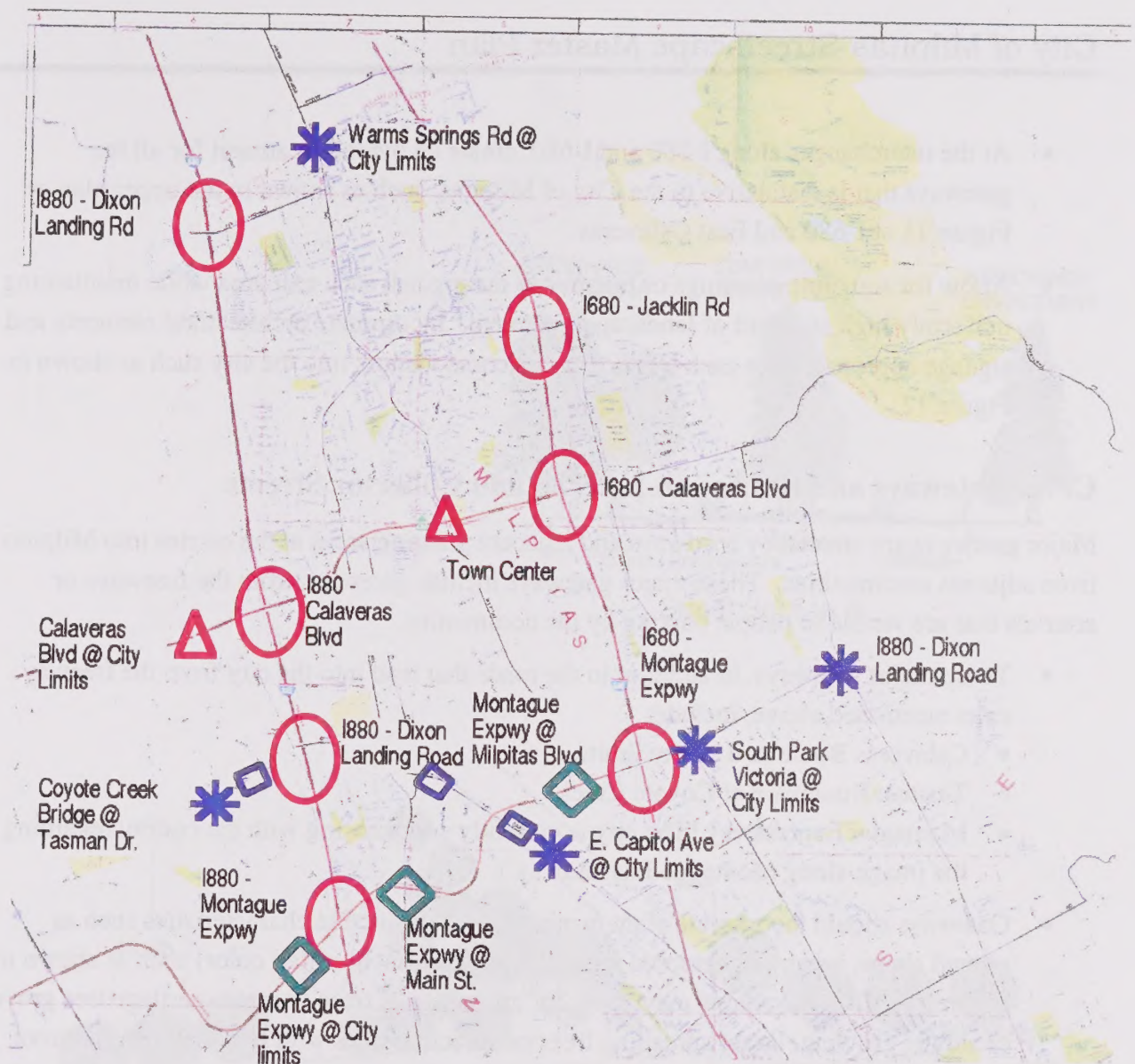
- 3.1. Enhance and define the character and form of specific gateways or entry points with distinctive plantings and streetscape amenities.
- 3.2. Encourage appropriate selection of plant materials with seasonal or perennial interest such as flowering, fall color, berries or fruit, unique form or bark.
- 3.3. Adopt a gateway feature to serve as a prototype for future gateways.

B. Freeway and Highway Gateways

The landscape areas around the freeway access ramps on I-880, I-680 and the adjacent feeder streets provide opportunities for gateway statements in locations such as shown on Figure 10. The city will need to negotiate an encroachment permit with Caltrans to be able to install and maintain plantings and other features in these areas. Caltrans may install improved landscape treatments provided a maintenance agreement is negotiated for the city to maintain the improvements. Within the next ten years there will be unique opportunities along I-880 relating to new freeway interchange construction.

Seven gateways can be developed to create a positive image for the City of Milpitas, for adjacent neighbors, the surrounding community and people passing by on the freeway:

- I-880 and Dixon Landing Road
- I-880 and Calaveras Boulevard (237)
- I-880 and Tasman/ Great Mall Parkway
- I-880 and Montague Expressway
- I-680 and Jacklin Road
- I-680 and Calaveras Boulevard
- I-680 and Landess/ Montague Expressway



Key to Symbols

- Freeway Interchanges (Coordinate with Caltrans)
- △ State Highway (Coordinate with Caltrans)
- ★ City Streets
- ◇ County Road (Coordinate with Santa Clara County)
- Proposed LRT Stations

Figure 10. Opportunities for Gateways & Entry Statements

- At the interchanges along I-880 and I-680, create an overall treatment for all the gateways that is distinctive to the City of Milpitas, such as shown in the upper plan on Figure 11 at I-680 and East Calaveras.
- Allow for signature plantings or features to distinguish each exit area while maintaining a uniformly high standard of landscape treatment. Incorporate architectural elements and signage appropriate for each location to welcome visitors into the city such as shown in Figure 12.

C. Gateways and Entries on Arterial and Collector Streets

Major gateways are created by roadways and adjacent planting areas at the entries into Milpitas from adjacent communities. These major gateways include gateways from the freeways or arterials that are visible to people passing by the community.

- These major gateways, in addition to the roads that lead into the city from the freeway exits mentioned above, include:
 - Calaveras Boulevard at city limits,
 - Tasman Boulevard at Coyote Creek,
 - Montague Expressway (The city is currently coordinating with the county regarding the image along Montague Expressway.)
- Gateways should incorporate plant materials with distinctive characteristics such as overall shape, height, or seasonal interest (spring blossom or fall color) such as shown in Figure 12. These locations may allow for groupings of trees to create heritage tree groves of slower growing, larger spreading trees or attractive trees with less well behaved root systems.

Additional gateways are entries, or those streets and adjacent planting areas that cross over the city limits of Milpitas from adjacent communities. Entry treatments should continue the same themes established by the other gateways. However entries often have more limited space available for distinctive tree plantings or signage.

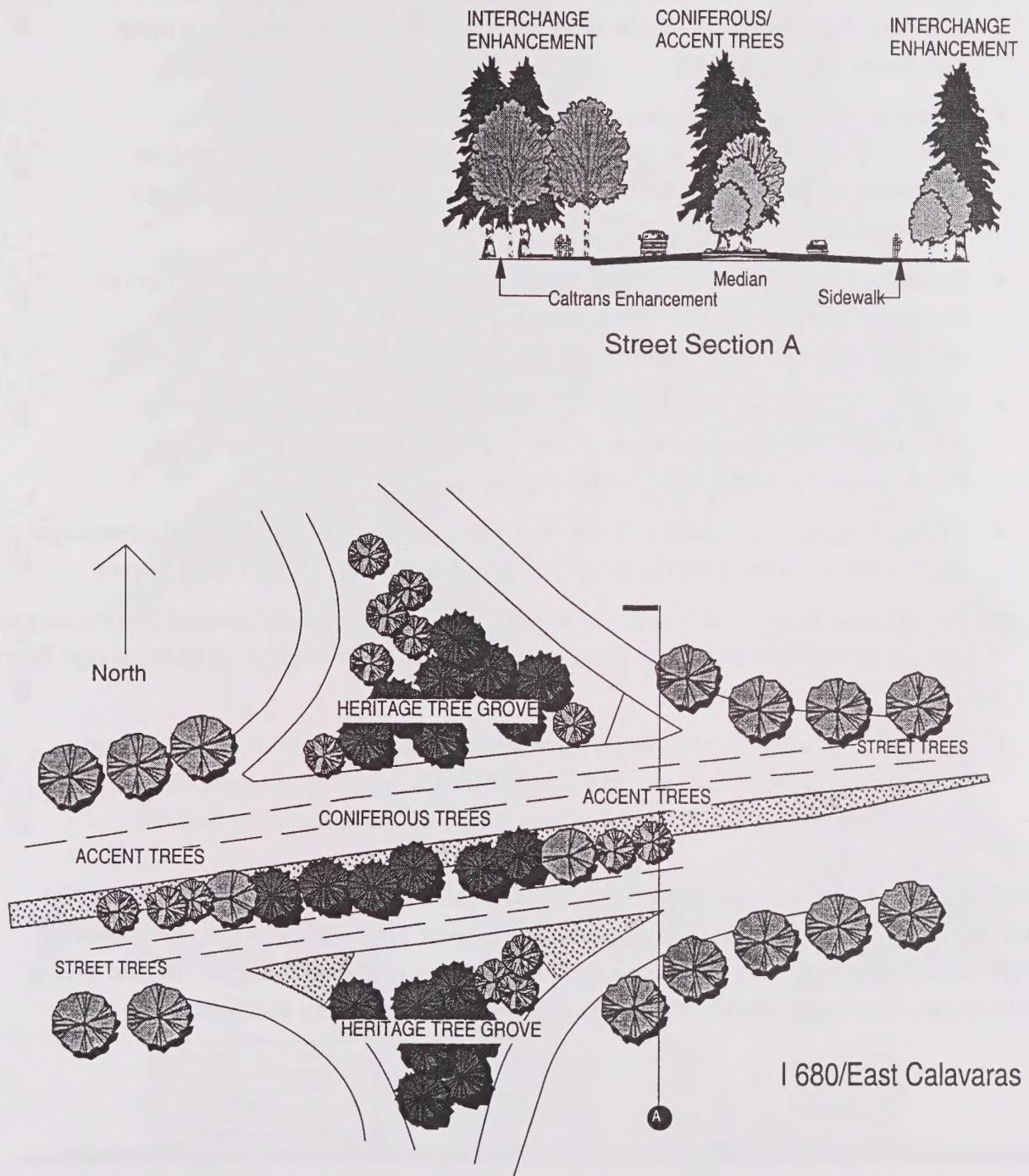


Figure 11. Gateway Treatment I 680

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Design opportunities for entry treatments at the city limits include the following streets:

- North Milpitas Boulevard. The right of way includes a planting area on east side of the Boulevard, south of the city limits. The existing sign should be replaced. New plantings should augment the existing shrubs to create a more significant entry statement. 
- Piedmont Avenue. The wide median north of Landess Avenue and undeveloped hillside on the west creates an opportunity to reinforce median planting with native trees and understory shrubs and groundcover to create a unique entry into the city. 
- South Park Victoria. There is little room for planting on South Park Victoria at the intersection of Landess. Coordinate the treatment in this area with the median planting on Montague east of I-680 overpass. 
- East Capitol Avenue. The limited right of way makes this entry a challenge. The new Montague light rail station and new landscape treatment offer an opportunity to create a coordinated entry statement. 
- Midtown Area. Coordinate with the Midtown Specific Plan for entry and streetscape improvements in the Midtown area on both South Main and South Abel Streets. 
- South Main Street. Evaluate the existing striped medians near Montague Expressway to add a landscaped median with trees, groundcovers and a Welcome to Milpitas sign near the city limits. 
- McCarthy Boulevard at Montague. The adjacent businesses have created an entry statement with their wide, mature landscape treatments. The planted median islands should be augmented to bring the street scene to the same level of treatment. 

There are also other gateways into the city that should be recognized as shown on Figure 10. Many of these are challenging in terms of the current road configurations that do not easily accommodate gateways. As these areas are renovated due to changes in adjacent land uses or street alignments, opportunities should be explored to make gateway statements.

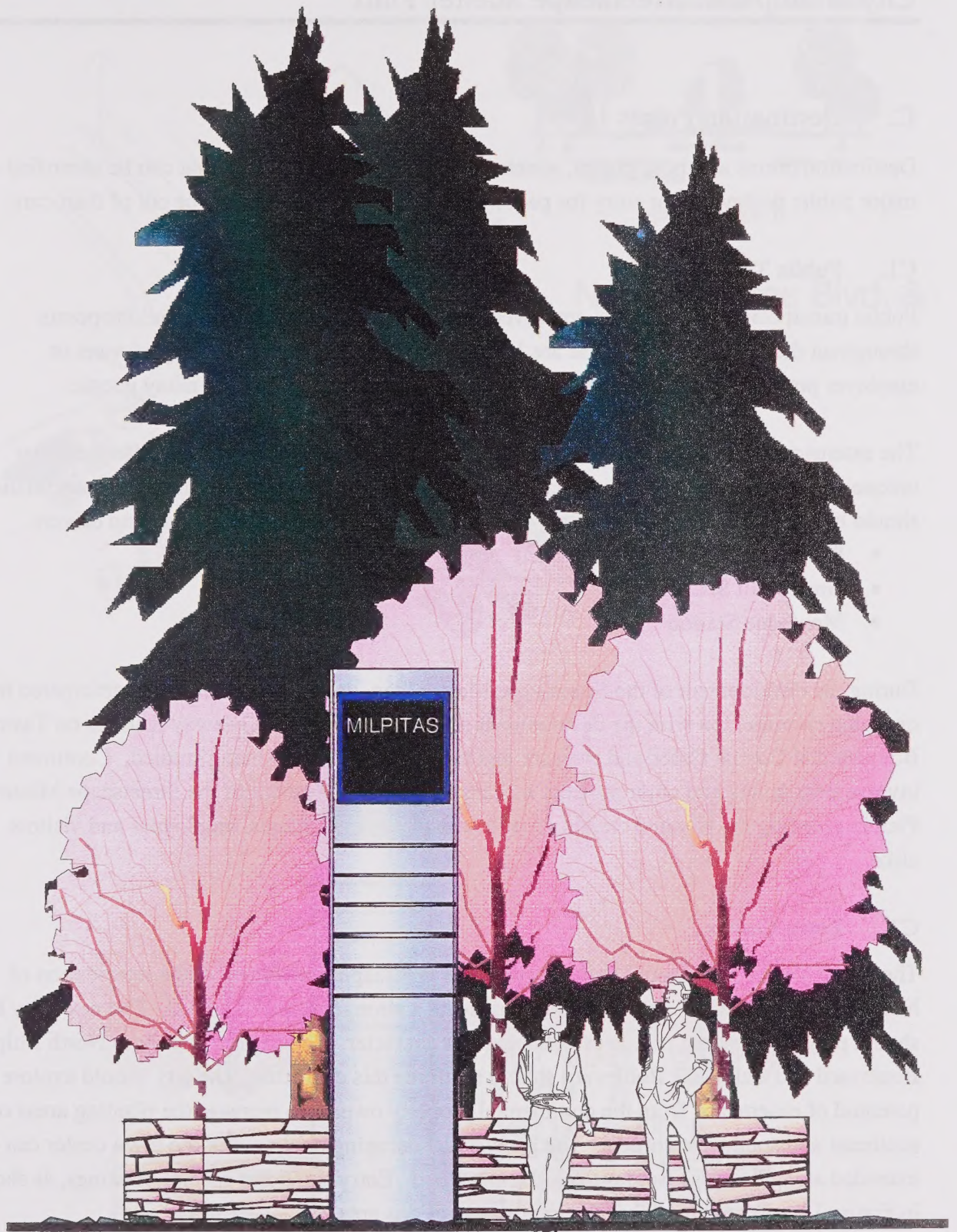


Figure 12. Freeway Gateway Elements

C. Destination Points

Destination points are those places, streets and adjacent planting areas that can be identified as a major public destination or entry for pedestrians getting off the light rail or out of their cars.

C1. Public Transit

Public transit connects residents, employees and visitors to many key destinations points throughout the city. Whether these are VTA buses, BART connectors, car pool vans or employer provided transportation, transit stops act as an entry points for many people.

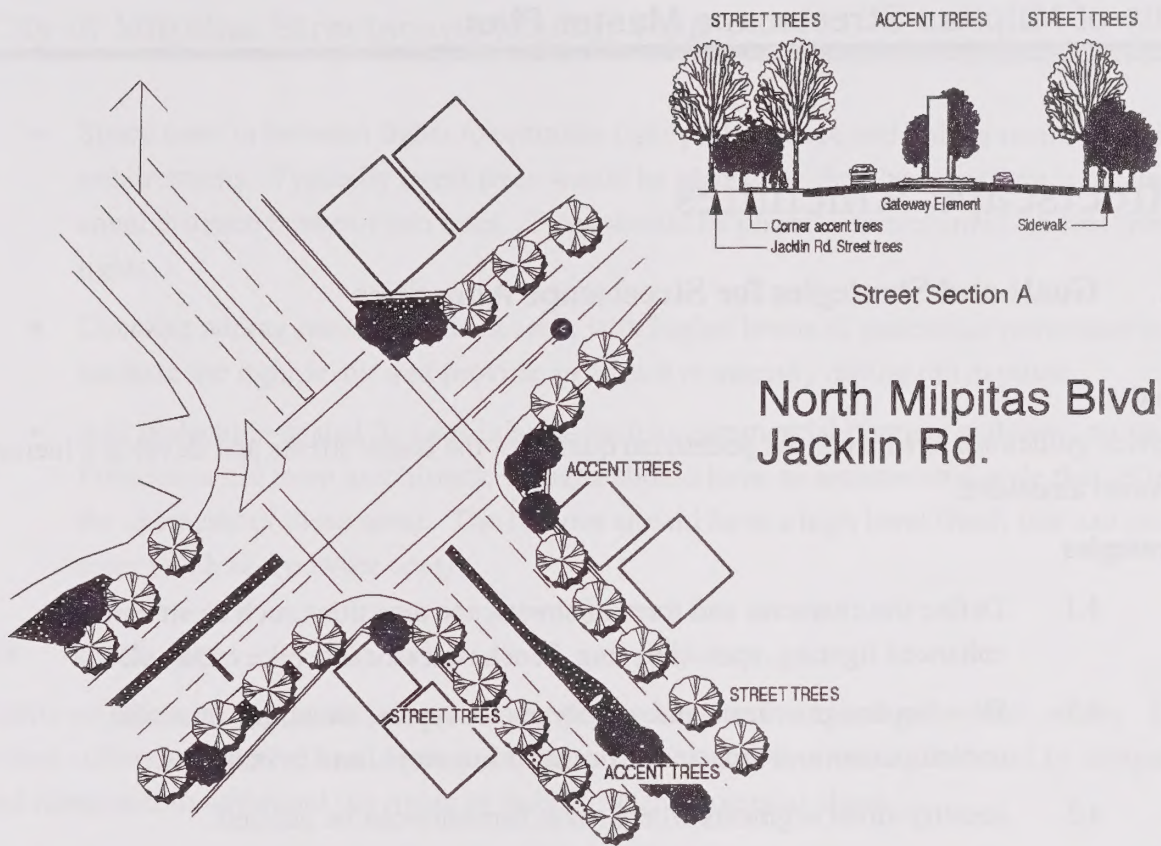
The extension of the light rail system along the Tasman/Great Mall Parkway offers another unique opportunity for welcoming statements. The areas adjacent to the three proposed stations should be treated as destination points with enhancements for both pedestrian and drivers.

- 880-Milpitas Station (at Tasman)
- Great Mall Station
- Montague Station

During the development of the Streetscape Master Plan, design team members participated in the on-going coordination with the development of light rail stations. Gateway features on Tasman Boulevard at Coyote Creek and the park and ride lot are currently being studied. Continued involvement in this and other projects will expand the effectiveness of the Streetscape Master Plan in greening the city and creating a welcome place for residents, employees and visitors alike.

C2. Town Center

The Town Center area should have an enhanced landscaping treatment at the intersection of North Milpitas and Calaveras Boulevard to create a stronger sense of arrival. The new City Hall should play a prominent role in establishing this character. The treatment of both North Milpitas Boulevard and Calaveras Boulevard should reinforce this character. The city should explore the potential of easements from the commercial property owners to increase the planting areas on southeast and southwest corners. The gateway landscaping treatment of the town center can be extended along Milpitas Boulevard to Jacklin Road. Entry signs and special plantings, as shown in Figure 13, can help reinforce the importance of this area.



North Milpitas Blvd. & Jacklin Rd.

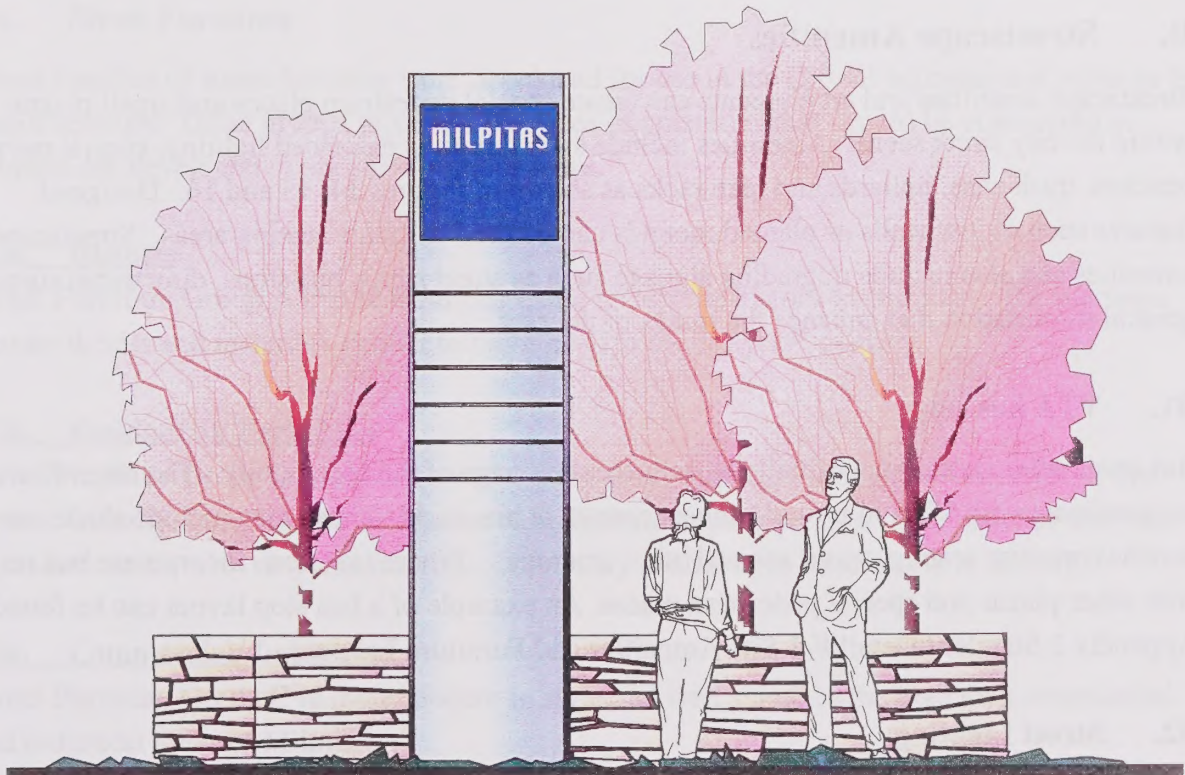


Figure 13. Town Center

Streetscape Amenities

A. Goals and Strategies for Streetscape Amenities

Goal 4

Provide guidelines to enhance the pedestrian quality of the major streets and develop a hierarchy of street amenities.

Strategies

- 4.1 Define the character and form of streetscape amenities such as art elements, enhanced lighting, special paving, benches, trashcans, bike racks, etc.
- 4.2 Develop design criteria and prototypes for typical situations (historic, contemporary and industrial) for use at bus stops, and in bulbouts.
- 4.3 Identify street segments where street furniture can be utilized.

B. Streetscape Amenities

Streetscape amenities and art elements can create special pedestrian places and small plazas within the city street scene. Amenities include such things as enhanced lighting, special paving, benches, trash cans, bollards and bike racks as shown in Figures 14, 15 and 16. Designed features such as low walls or planted mounds can be used to create seating areas. Streetscape amenities can also include upgrading signage such as street signs, bus stops, directional signs and general information that enhance the image of the city.

B1. VTA bus stops

Bus stops offer another opportunity to enhance the image of the community. The city will need to coordinate with VTA to provide enhancements at bus stops. These may include shade trees, benches or other seating, trashcans and other amenities. Where practical, incorporate bus stops with other plazas and special pedestrian places. An example of a bus stop layout can be found in Appendix 2 Standard Detail F-1 Site Amenities and Furniture Layout.

B2. Street Lighting

Street lighting is currently dictated by traffic safety standards. Street lights enhance the overall quality of a street appearance if the fixtures are selected for not only their night lighting performance, but also their daylight appearance. Considerations for enhanced streetlights:

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- Space trees in between lights to optimize light performance and reduce maintenance requirements. Typically street trees would be planted so that the streetlight is located equal distance between two trees. Trees should be placed a minimum of 10 feet from lights.
- Consider adding median lights in areas with higher levels of pedestrian movement to increase the light levels and provide an attractive amenity during the daytime.
- Add pedestrian-scaled fixtures in areas such as commercial districts and town center. Fixtures in old town and historic districts should have an architectural style that reflects the character of those areas. The fixtures should have a high level finish that can include color (such as a powder coat).

B3. Public Art

Public art offers an opportunity for a community expression that is unique to each setting. It can reflect cultural resources, local history, or the surrounding environment. It should be designed and fabricated to withstand the rigors of public use and potential abuse.

B4. Street Furniture

Three families of street furniture were developed for use in the City of Milpitas that relate to the major settings. These groups represent the types of amenities that should be considered as projects are developed in the street right of ways.

B3a. Historic

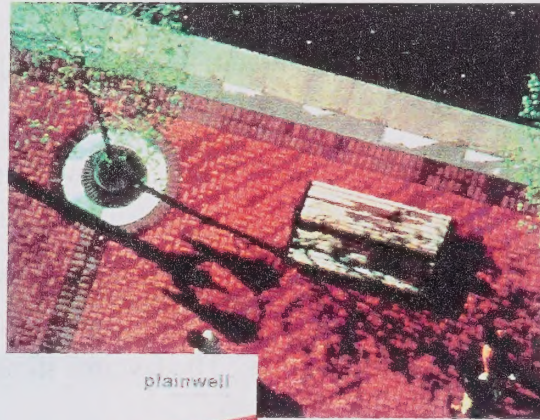
Street Furniture Group A includes furniture that recalls the history of Milpitas. The elements feature details and materials similar to those used in the early 19th century.

B3b. Residential/ Park-Like

Street Furniture Group B has furniture that is not from a specific time period in history. The style is friendly, familiar and well suited to residential or park settings. The benches and trash containers made with recycled materials are readily available as stock items in this style.

B3c. Commercial/ Industrial

Street Furniture Group C is more modern in style and well suited to the high tech commercial and industrial areas of Milpitas.



plainwell



Figure 14. Street Furniture - Historic



Figure 15. Street Furniture - Residential/Park-Like

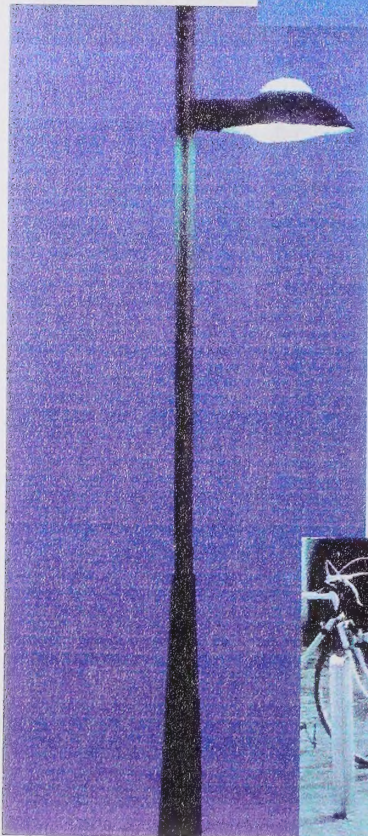
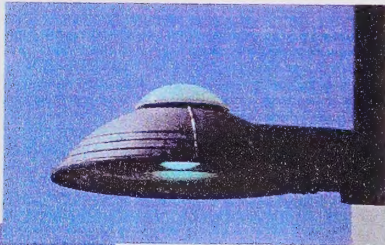
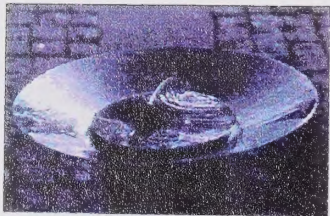


Figure 16. Street Furniture - Commercial/Industrial

Irrigation & Use of Recycled Water

A. Goals and Strategies for Irrigation & Use of Recycled Water

Goal 5

Identify appropriate irrigation systems and operational standards that support the city-adopted water conservation ordinance and use of the recycled water supply.

Strategies

- 5.1 Promote water conservation and efficient use of potable water as set forth in Title VIII Public Works Chapter 5 Water Efficient Landscapes and Title VII Public Utilities Chapter 6 Water Conservation of the Municipal Code.
- 5.2 Refine city standard details for irrigation equipment installation and establish a city standard equipment list for both recycled and potable water systems.
- 5.3 Require new city irrigation projects to connect to the central control system and weather stations.
- 5.4 Provide developers and private landowners with the standards established in the Municipal Code for all privately installed and maintained systems.
- 5.5 Incorporate water management and water waste prevention practices into existing landscapes within the street right of ways.
- 5.6 Design, install and maintain irrigation systems within the street right of way for water efficiency.
- 5.7 Upon installation of the irrigation systems, an irrigation audit shall be conducted by a Certified Landscape Irrigation Auditor (CLIA) certified by the Irrigation Association. Subsequent water audits, as a part of regular maintenance shall be in accordance with the State of California Landscape Water Management Program.
- 5.8 Develop standards for evaluating reuse of existing equipment, meters, and electrical connections in new city projects.
- 5.9 Promote use of recycled water for irrigation of trees and plantings within the street right of ways where the water supply is available. Provide guidelines for proper design and use of recycled water, including horticultural requirements.
- 5.10 Encourage employee participation in the irrigation certification programs of the Irrigation Association and set aside budgetary funding for this purpose. Increase

awareness for all employees of ETo (evaporation/ transpiration) concepts, use of hydrozones and value of irrigation audits.

B. Determining Irrigation Needs

Inclusion of an irrigation system needs to be a part of the evaluation of the all streetscape projects that include plantings. The size of the planting areas and physical separation, available water source (domestic or recycled), electrical power source for controller, as well as the available budget all need to be factored into the streetscape design. The following options should be considered and applied as appropriate:

- **No Irrigation.** No irrigation is often appropriate when the project is as small as replacing an individual street tree. From a cost standpoint, it would not make sense to install a meter, controller, valve, bubbler, etc. just for one tree. This tree could be truck-watered on a regularly scheduled basis until established.
- **Truck Watering.** A small-scale project with drought tolerant plant materials might also be more cost effective to water by truck. The cost to truck water until plants are established should be compared to the price to install an automatic system. This will depend on the size of the area, the amount of time until plants become established, and the labor involved with truck watering. This would have to be evaluated on an individual project basis to determine the most cost-effective approach.
- **Renovation of an Existing Irrigation System.** Renovation of an existing irrigation system is most appropriate where the system has been installed within the last 5 years, is in good operating condition, and is water efficient. An old system that requires frequent repairs, wastes water or is not compatible with the central computer system should be replaced. In some cases, existing systems can be retrofitted. However, if recycled water is or will be available at the site, it will usually require installation of a new system that meets health and safety requirements.
- **New Irrigation System.** New construction projects should be designed to incorporate the installation of an irrigation system. Types of projects include medians, planter strips, large planting areas and large-scale street plantings. Irrigation systems are recommended wherever possible and practical. This will help insure the application of the proper amount of water to keep all plant materials healthy and thriving, without wasting water. Projects located adjacent to an existing or future recycled water line should be designed to use recycled water.

C. Use of Recycled Water

The use of recycled water (also known as reclaimed water) for streetscape landscaping is appropriate when horticultural conditions have been considered. The city continues to expand the recycled water infrastructure to allow both public and private landscapes to use this valuable alternative water source.

Recycled water is created from wastewater processed and treated at the San Jose/Santa Clara Water Pollution Control Plant. The recycled water undergoes a carefully regulated purification and disinfection process to assure horticultural suitability. Generally the recycled water meets or exceeds most drinking water standards. However, given the heavy clay-textured soils and the occasionally elevated levels of salts and other constituents found in Milpitas soils, some caution is to be exercised when using recycled water for streetscapes. Site soils, irrigation delivery systems, recycled water constituents, and proposed plant species need to be evaluated for each individual project to determine the appropriate environment to provide for landscape sustainability. The major issue associated with recycled water is the build-up of salts in the root zones that can result ultimately in plant loss. In areas of heavy clay textured soils, the commonly used remedy of leaching salts by application of additional water is limited in effectiveness due to poor drainage capability.

Specific technical considerations are discussed further in Appendix 1 Technical Recommendations: Sections VI. Irrigation, and VII. Use of Recycled Water.

Streetscape Maintenance

A. Goals and Strategies for Streetscape Maintenance

Goal 6

Identify proper management and maintenance practices to increase the longevity of the City's trees and landscape plantings.

Strategies

- 6.1 Require all city tree maintenance and removal be in accordance with the standards established by the International Society of Arboriculture (ISA) and American National Standards Institute (ANSI).
- 6.2 Update and maintain the inventory data base of all public street trees and plantings and utilize this information for maintenance, planting schedules, coordination with infrastructure projects, education and public administration. Add information on new plantings as they occur. Coordinate inventory with right-of-way and pavement management inventories.
- 6.3 Provide for an inter-planting program in areas of mature trees to increase the age diversity of the urban forest and promote sustainability.
- 6.4 Prioritize a proactive replacement program to identify trees to be removed and replaced. For all trees removed due to inappropriate species, placement, age or disease; with at least one new suitable tree in the most appropriate location. Optimize opportunities to fill vacant street tree locations when properties transfer ownership.
- 6.5 Develop a program to address pavement and utility damage as trees mature.
- 6.6 Develop a comprehensive hardscape management strategy and program to address damage to sidewalks, curb and gutter, and paving by street trees and other plantings.
- 6.7 Removal of healthy trees should be based on a case by case evaluation with replacement encouraged at a ratio greater than 1:1. Maintain healthy trees causing minimal damage as defined in the discussion on minimizing concrete damage in Appendix I.
- 6.8 Encourage employee participation in the arborist certification program and associated training of the Western Chapter of the International Society of Arboriculture and set aside budgetary funding for this purpose. Increase

awareness for all employees of these guidelines and obtain their proactive support of the program.

- 6.9 Require all contractors to consult the City Arborist before construction takes place around established trees. Any trees that are removed or severely damaged by construction should be replaced. If tree replacement is not possible, the contractor should contribute the dollar value of the tree (as determined by ISA standards) to a streetscape fund for tree and landscape planting.
- 6.10 Incorporate protection of assets and cost recovery into in all aspects of streetscape design, installation and on-going maintenance operations.

B. Streetscape Maintenance Issues

Streetscape maintenance includes a wide range of activities. Several city ordinances such as the Tree and Planing Ordinance and Neighborhood Beautification Ordinance relate to the protection of city assets and the long-term sustainability of streetscape improvements. Protection of assets begins with appropriate design, engineering, material selection and installation. Sustainable on-going maintenance, including replacement and cost recovery after accidents, vandalism or ordinance infractions, are key to successful streetscapes.

General housekeeping such as the repair of street furniture or servicing of trash containers are required on a regular basis to maintain the quality of such amenities. Selecting furniture and other streetscape elements that are designed for public use, and installing them in locations that are highly visible reduces the potential for vandalism. Many cities have found that a program of prompt removal or repair of damaged items also reduces subsequent vandalism, by sending a message that the community cares about its streetscape. Use of anti-graffiti coatings and a timely removal of graffiti by repainting the entire object (instead of just covering up the graffiti with paint that often does not match the background) sends a message that the community cares for its public amenities.

Beyond the general housekeeping issues are technical maintenance issues related specifically to street trees and landscaping. The Streetscape Master Plan guidelines have been developed to facilitate the design and installation of sustainable projects. Through appropriate tree selection, plant placement, site-specific environmental considerations, and effective irrigation systems, new streetscapes can be easier to maintain and have a longer, healthier life span. More detail information can be found in Appendix 1. Technical Recommendations Section VIII. Streetscape Maintenance.

The proper pruning techniques and the identification of unacceptable practices are important to maintain healthy urban trees as well as to minimize the potential for hazardous conditions. There are a number of liability issues related to damage caused by trees, including such things as fallen branches, wind damage, overhanging branches, obstruction of visibility or traffic signals, and roots clogging private sewer or drain lines. Many of these issues can be minimized through the application of maintenance standards and preventative maintenance practices.

The responsibility for damage to curbs, gutters and sidewalks is another area of streetscape maintenance. The California Streets and Highway Code places responsibility for maintenance and repair on the adjacent property owner. However in Milpitas, the city budgets \$125,000 to \$150,000 annually for sidewalk repair. The city also uses a higher standard for repairing and replacing sidewalks than many of the surrounding municipalities. Details of this repair standard and guidelines for minimizing future damage are discussed in Appendix 1. Technical Recommendations Section V. Minimizing Concrete Infrastructure Damage.

Coordination with Other Programs & Public Awareness

A. Goals and Strategies for Coordination with Other Programs & Public Awareness

Goal 7

Enhance the coordination with city planning efforts, project development and on-going city programs. Increase public awareness and understanding of the value of street trees and right-of-way plantings.

Strategies

- 7.1 Coordinate with on-going city programs and projects such as the Midtown Specific Plan, Tasman Corridor Light-rail Extension, citywide Trails Master Plan, Recycled Water Pipeline project, Neighborhood Beautification, Citizen Advisory Committee projects; Montague Expressway Widening, Rule 20 A Undergrounding Projects, Pavement Management System, etc.
- 7.2 Review and update city ordinances related to street trees and other plantings (Title X Chapter 2), Water Efficient Landscapes (Title VIII Chapter 5) and Water Conservation (Title VII Chapter 6) as process improvements are implemented. This may be when there are advances in technology or mandated legislation.
- 7.3 Recommend production of a series of tree and landscape information bulletins that address the public's most frequently asked questions (FAQ) regarding the city streetscape and related programs. Post this information on the city web page as well as distribute at city events such as Arbor Day.
- 7.4 Continue to increase the recycling of tree and landscape residues to reduce landfill requirements and provide mulch in planting areas.
- 7.5 Promote cooperative programs with local agencies, school district, utilities and private companies such as VTA, Pacific Gas and Electric, Santa Clara Valley Water District, adjacent cities of San Jose and Fremont, Santa Clara County, and state and federal agencies.
- 7.6 Evaluate the National Arbor Day Foundation Tree City USA program guidelines for possible advantages for future funding of new projects, positions, committees

and policy implementation. Evaluate the international organization “Nations in Bloom.”

- 7.7 Seek grants from state and federal funding sources on special programs for the on-going streetscape improvement program for:
- Procuring trees and other landscape materials for planting in the right of way.
 - Preparing educational and awareness materials for public distribution
 - Updating and maintaining the existing tree inventory database
 - Establishing a tree and planting advisory board.
 - Establishing a citywide streetscape fund for individual and business donations.
 - Encouraging nursery donations and requiring contractor contributions for trees killed or damaged during construction.
- 7.8 Coordinate development on private property with adjacent streetscape improvements using tools such as transfer of development rights, zoning ordinances or easements.
- 7.9 Coordinate with the South Bay Water Recycling Program on the use of recycled water for irrigation. The program is a resource for information and advice on using recycled water.

B. Coordination with Other Programs, Master Plans and Planning Documents

Many of the issues addressed in the Streetscape Master Plan relate directly with on-going programs and several other city planning efforts. The recommendations and guidelines are developed to directly support city policies and programs such as the Neighborhood Beautification Ordinance, the greening of Milpitas, protection of assets, cost recovery, and implementation of the Milpitas Trails Master Plan. Concurrent projects include the Midtown Specific Plan, I-880 and 287 interchange improvements, Light Rail extension on Tasman and Great Mall Parkway, and the Montague Parkway improvements.

The Streetscape Master Plan recognizes that other guidelines establish the standards for specific areas, such as the recently adopted street landscaping design criteria for McCarthy Ranch. The intent of the Streetscape Master Plan is to augment those specific standards with citywide guidelines that can serve as a resource on issues that may not be covered by the specific standards. This Streetscape Master Plan should in no way be used to supersede specific requirements or adopted city policies.

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C. Public Awareness

A truly successful urban forestry program includes a dynamic combination of roles for the community and government agencies. Maintenance costs today are far beyond that which most cities can afford; the cost of public education and training is beyond that which most believe is necessary. Even with sufficient funds, it is simply no longer possible to establish trees in most large cities without an extraordinary level of public involvement.¹

People who can get involved in tree-planting programs fall into a number of different categories:

- ❖ Individual Citizens
- ❖ Youth
- ❖ Politicians
- ❖ Organizations (churches, clubs, homeowner groups, etc.)
- ❖ School classrooms
- ❖ Citizen Commissions (Trees, Public Works, Parks)
- ❖ Urban Forestry Professionals
 - Arborists
 - Landscape Architects
 - Landscape Maintenance Firms
- ❖ Telephone and Electric Utilities (line clearance)
- ❖ Businesses
- ❖ Environmental Organizations
- ❖ Government Agencies, including:
 - City Forester/Arborist
 - Public Works Department
 - Road or Highway Department
 - Parks Department
 - Fire Department
 - Other Forestry Agencies (county, state, and federal)
 - Environmental Quality Board
 - City Departments (Planning, Building, Safety and Engineering)
 - Agriculture Commissioner
 - Milpitas Unified School District

Many or all of these players are already involved with trees in Milpitas. Historically, they have acted independently, but with the rise of urban forestry as a profession, cities are increasingly making an effort to coordinate them. A list of web sites and information sources for developing community based tree programs are included in Appendix 3 Volunteer and Community Based Tree Programs, Section B. Community Based Tree Programs and Information Sources for Volunteers.

¹ Andy and Katie Lipkis, TreePeople.

City Ordinances, Financing and Implementation

A. Existing Ordinances Related to Streetscapes

A1. History of Streetscape Development in Milpitas

Milpitas history is rooted in an agricultural landscape. Milpitas literally translates to “little cornfields.” After World War II the city developed rapidly as a suburban community with many residents commuting to work outside of the community. Several of the residential neighborhoods included street tree plantings as a part of the original development. Most of these trees are now 50 to 60 years old and likely to be approaching the end of their useful life within the next 10 to 20 years. To protect the quality of the neighborhoods from traffic noise on major streets, many of the neighborhood developers installed soundwalls. Most of these soundwalls were of inexpensive construction using wood and stucco and are reaching the end of their useful life. Several of the neighborhood streets were developed with a landscaped parking strip between the curb and the sidewalk. When these narrow strips are landscaped and well maintained they are an asset to the community. However, if the community allows these strips to fill up with weeds, paves over them with concrete, or changes the character with unacceptable types of plants, they can become an eyesore and source of neighborhood friction.

In the last 20 years, business, light industry and especially research and development related to the computer industry have grown in the western and southern portions of the city to create a strong economic base. The newer of these industrial parks were developed with landscape requirements that have created a highly desirable streetscape. However these dense plantings of trees, shrubs, groundcover and trees will also reach the end of their useful life within the next 10 to 20 years.

Today much of the city is built out and new construction is largely in-fill replacing older uses. The physical plant, both private development and the infrastructure of public facilities has aged and continues to undergo gradual renovations and restorations. Replacement of declining landscaping on private residential, industrial or commercial properties will be a major challenge that needs to be planned for in addition to maintaining the public streetscape.

A2. Existing Ordinances Relevant to Streetscape Improvements

The City of Milpitas Municipal Code has several ordinances that relate to the provision, management and protection of streetscape assets.

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Title X Streets and Sidewalks Chapter 2 - Trees and Planting

This chapter of the municipal code contains the key policies related to trees and plantings on city property. It establishes the city responsibilities such as the Approved Street Tree List and Tree Replacement Fund. It also includes regulations related to planting, removal or trimming permits; maintenance; other plantings and improvements; tree asset protection; enforcement and appeals.

Title VII Public Utilities Chapter 6 - Water Conservation

Milpitas is progressive in conserving water not only for landscapes and irrigation, but also by restricting use of potable water and by requiring the use of shut off nozzles and other water saving equipment. This chapter also requires the use of available reclaimed water for irrigation.

Title VIII Public Works Chapter 3 - Backflow Prevention and Cross Connection Control

Backflow prevention and cross connection control protect the quality of the city domestic potable water. This chapter includes the requirements for double check valve assembly on all irrigation systems.

Title VIII Public Works Chapter 5 - Water Efficient Landscapes

This chapter contains both policy language and a great deal of technical information about the use of landscape and irrigation design that are water efficient. It includes provisions for both new and rehabilitated landscapes and requires documentation packages conforming to the requirements be submitted to the City Engineer prior to issuing permits.

Title XI Zoning, Planning and Annexation Chapter 10 – Zoning

This chapter includes the landscaping standards for each of the land use districts in the city.

Title V Public Health, Safety and Welfare Chapter 202 - Weed, Rubbish, Refuse, Dirt Control and Abatement

This chapter of the municipal code provides definitions of weeds and other accumulations that may occur on private property and can be cited as a public nuisance. The code documents the legal process for declaring a nuisance, noticing, hearing, and ordering to abate the nuisance. It also documents the accounting process, collection process and alternative procedures. While this procedure is most likely used as a final resort it does provide the city with the tool to require property owners to maintain the landscape in parking strips and other privately owned land adjacent to the public street.

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A3. Master Plans and Planning Documents

This document is the first comprehensive Streetscape Master Plan for the City of Milpitas. Street tree plantings, irrigation improvements and other related streetscape work have been included in the Capital Improvement Program on a project basis. Standard details for tree planting, streetlights and irrigation are included the Assistant City Manager Department Engineering Division Standard Drawings. Requirements for improvement plans can be accessed through the city web site at www.ci.milpitas.ca.gov/40377.html#top.

The Milpitas Trails Master Plan describes and maps approximately 37 miles of trails included in the Circulation Element of the General Plan. An off street trail system will enhance the quality of life within Milpitas. Improvements to these trail corridors include elements such as landscaped buffers and amenities similar to those proposed in the Streetscape Master Plan. On-street connectors consists of on-street bicycle lanes and routes that link segments of the off-street trail where no other route is available. These facilities should be developed in conjunction with other streetscape improvements.

The General Plan Circulation Element identifies the street network and classifications.

A4. Tree and Landscaping Section Policies and Practices

The Tree and Landscaping Section is responsible for a variety of services related to streetscapes, tree care, irrigation and landscaping within the public street right-of-way. The Section description, performance indicators, accomplishments and objectives and are published annually in the city budget and financial plan document. Services include:

- Emergency response. Crews remove fallen trees and limbs, broken hanging limbs and other tree related immediate hazards. The Tree and Landscape Section also assists other departments in cost recovery due to accidents, vandalism or ordinance infractions.
- Potential hazard abatement and tree removal. Potential hazards include leaning trees or trees with other structural defects, low hanging limbs, trees or limbs blocking traffic signals, stop signs or cross walks. Staff also is responsible for identifying tree related sidewalk damage, performing root pruning and filling tree openings in sidewalks to prevent tripping hazards.
- Tree ordinance related processes and information.
- Tree inventory. The Tree and Landscape Section maintains a street tree inventory.
- Planting or replanting of street trees and landscaped areas.
- Routine tree and landscape maintenance.
- Tree pruning, root pruning and pruning service requests.
- Pest and disease control is done according to an integrated pest management system using best management practices.

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- Landscape irrigation is an integral part of new major streetscape project design and connected to a centralized irrigation system. The Tree and Landscape Section provides repair and maintenance of the existing systems, and manually waters non-irrigated landscapes.

The Streetscape Master Plan recommends that a number of new practices be incorporated into public projects. These practices increase the initial capital costs of projects; however, the increase is offset over the life of the landscape through decreased maintenance costs. By reducing damage to infrastructure, and encouraging healthy plant growth, streetscape improvements can provide a longer useful lifespan, while reducing pest, disease and other maintenance requirements. New practices include:

- Installation of root barriers with new plantings, sidewalk repair and utility line repair. Installation of root barriers near sewer lines to prevent infrastructure damage.
- Installation of structural soil under paving adjacent to planting areas less than 4 feet wide and at sidewalk planting cutouts.
- Alternate sidewalk configurations to allow for additional root growth.
- Soil testing and improvement prior to planting.
- Landscape subsurface drainage in conjunction with soil improvement where appropriate.

B. Funding Sources¹

The City of Milpitas currently funds streetscape projects and on-going maintenance through use of public funds and the Capital Improvement Program (CIP) process. Available funds primarily come through the Street Fund program and compete with projects for road widening, sidewalk repairs, utility undergrounding, trails, street lighting and other improvements. Some projects, such as the Escuela Parkway and North Milpitas Boulevard median replanting projects, have been funded through RDA tax increment funds. In 1999 the allocation to streetscape projects was for the first year of multi-year projects representing over \$3 million. These projects included a gateway sign, sound wall repair, streetscape replanting and irrigation upgrades over a five year period.

The city also competes regionally, statewide and nationally for grants and other public funds. A number of granting sources have developed in the past years that focus on the types of improvements recommended by the Streetscape Master Plan. Many grants are associated with transportation improvements and the development of livable communities, such as the TEA 21

¹ Additional information on alternative funding sources and other cities' successful programs are included in the Appendix 4 Tree and Hardscape Program Funding Mechanisms.

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and TLC grants. Other sources of funds focus on urban forestry and sustainable ecosystems. The Streetscape Master Plan has identified the areas where streetscape improvement goals support other types of project goals, such as traffic calming, alternative transportation, and trails development in order to make the streetscape improvement projects more desirable to granting agencies.

Other funding sources available for funding streetscape enhancement projects are the regional utility company and highway funds. Pacific Gas and Electric has dedicated funds from the Public Utility Commission for undergrounding utility lines called “PUC Rule 20A” funds. These projects usually result in disturbance to sidewalks and streets. They are often the catalyst needed to leverage other public funds to install street trees, irrigation and other amenities as a part of the basic undergrounding project. County road improvements using Measure A/ B funds are currently being used for improvements on Montague Expressway. Caltrans projects have been previously mentioned under the guidelines for developing community gateways. Two projects are currently underway where Caltrans and the city are working together to provide enhanced landscape treatments at East Calaveras and the I-880/ I-237 interchange.

Bonds, developer impact fees (streetscape dedication fees), special districts and tax increment funding are other viable public funding mechanisms. They can be effective ways to obtain a dedicated long term funding source to meet a specific need. These mechanisms require support of the policy makers and citizens. Each type of funding has specific legal requirements and voter support that must be followed. While none of these mechanisms are recommended at the present time, they may prove a viable alternative as the existing urban forest ages and the city is faced with larger maintenance and replacement costs related to hazardous trees and an aging urban forest.

The final source of funds that is often overlooked is private community fund raising. In general, donations from individuals or community groups account for a high percentage of private sector giving – over 80% when compared to grants, corporate contributions or bequests. Most of these donations are gathered in community wide fund raising programs that often provide not only dollars, but also in-kind contributions, matching gifts and volunteer labor. The most successful fund-raisers focus on highly visible features with which the community can readily identify. Successful campaigns reach out not only to individuals, but also to local businesses, special interest groups, and corporations or organizations with regional connections. Streetscape improvements such as tree plantings, landscaping renovation and clean-up days are likely subjects for community campaigns. These areas provide opportunities to appeal to the civic pride of the community and provide tangible, long lasting results for donations. Strategizing the campaign to allow for momentos, naming opportunities and individual recognition within the

City of Milpitas Streetscape Master Plan

city streetscapes can be an effective way to spur involvement. The city already has a number of on-going programs developed under the Neighborhood Beautification Ordinance. These programs include:

- Adopt-A-Spot
- Neighborhood Beautification Awards
- Volunteer Program
- Lend-A-Tool

To ensure the success of streetscape implementation it is important to nurture a strong relationship with the local media. The Tree and Landscape Section should establish and maintain strong radio, television and newspaper contacts. Information should be posted on the city web page. All sources of media attention should be fostered by effective public relations on regular special events, such as Arbor Day, as well as one time celebrations such as the completion of a major project.

C. Funding & Implementation Strategies

The Streetscape Master Plan is designed to be a blueprint for multi-year projects to improve the overall quality of streetscapes throughout Milpitas. Several projects were identified as initial models. Implementation should utilize three major strategies to fund and achieve Streetscape Master Plan long term goals.

C1. Joint Projects

Joint projects provide the opportunity to work with other agencies and funding sources to achieve common goals, or supplement a project and achieve an enhanced streetscape. During the planning process the consultant team and staff coordinated on a number of key projects and plans. These included:

<u>Project</u>	<u>Agency</u>
Light Rail Expansion and Stations	MTA
Freeway Interchanges	Caltrans
Montague Expressway	Santa Clara County
Midtown Specific Plan	Planning Division

These projects are just a few of the potential opportunities to continue coordination with outside agencies to implement the Streetscape Master Plan. Joint projects with private developers should also be viewed as a viable option, though they are not as common as projects with other government or public agencies.

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C2. Capital Improvement Program

The Streetscape Master Plan recommendations for key projects were included in the Capital Improvement Program process for the 2001 budget. This process will be the most stable of the funding sources for the implementation of the Streetscape Master Plan. However, streetscape projects do compete with other important projects in a limited funding pool. Projects should be designed to achieve multiple goals so that they clearly benefit the community, address safety issues and create a sustainable environment over the long term.

C3. Grants

Grants offer a way to supplement the city and other agency funds. The focus of grant sources change from year to year. However, identifiable capital improvement projects have a higher funding success rate than on-going programs. The current funding sources that incorporate streetscape improvements are primarily focused on transportation, livable communities, trails, as well as street trees and urban forestry. Grants require that the proposal/funding cycle be identified and specific project requirements met. Some grants require that the project design be completed and ready to bid/construct. Other grants cover funding requests for the planning process. Joint projects are often favored over projects sponsored by the city alone.

The project descriptions developed during the master planning process support the CIP budget process and will help with grant proposal writing. Other key elements of the Streetscape Master Plan, such as the goals and guidelines will provide the granting agencies with the city's long term streetscape vision. Grants are often a hit and miss proposal. They offer a way to accelerate the implementation of the Streetscape Master Plan, but because of their competitive and focused nature they are best viewed as a supplemental and reimbursable source compared to the other two strategies for implementation of the overall streetscape program.

The Streetscape Master Plan has been developed to be flexible to allow staff and others to pursue implementation funds as the opportunities arise. Therefore a specific priority list of projects was not established in the Streetscape Master Plan. The preliminary list shown in Figure 18 and following methodology for project identification and prioritization should be used as general guideline for implementation.

Coordinated with Other Agencies

- Lightrail Stations (VTA)
- Montague Expressway (Santa Clara County)
- Calaveras – I-880 interchange (CalTrans)
- Able Street (Santa Clara County)

City Projects - Coordinated with Other Departments

- Mid-town Specific Plan
- City Hall Replacement
- Carlo Mini park
- Trails development (Penetencia & Berryessa Trails)
- Mt Shasta
- Escuela Walkway & Plaza near High school

Funded CIP Project that are on Hold

- North Milpitas Boulevard
- West Calaveras
- East Calaveras Boulevard
- Escuela Parkway

Sponsored Projects

- Piedmont Boulevard
- South Park Victoria
- North Park Victoria (up to Jacklin)

Gateways & Entries

- North Park Victoria (Scotts Valley Road)

Planting Strips

- Sequoia

Pilot Projects for Aged Tree Replacement

- O'Toole Elms
- Residential Street
- Commercial Area
- Industrial Area

Sound Wall Improvements

- Hillview
- North Park Victoria

Figure 17. Preliminary Priorities for City Streetscape Projects

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D. Streetscape Project Identification & Prioritization

The Streetscape Master Plan identifies a variety of project types that are necessary in order to develop, maintain and improve the existing streetscape throughout the city. Preliminary descriptions of seven key streets were prioritized for the city's 2001 - 2006 CIP. Several of these projects expand upon funded 1999 - 2000 CIP projects that had either been placed on hold, or are on-going. During the life of the Streetscape Master Plan it is anticipated that priorities will change as the streetscape develops and new issues arise. The following is a preliminary prioritized list of project types that should be evaluated each year for consideration in that year's Capital Improvement Program:

1. Joint projects with other agencies or private sector development include work on Calaveras overpass with Caltrans, Montague Expressway with the County of Santa Clara and the Light Rail Stations with VTA.
2. Key streets identified as projects on hold, or are highly visible and have streetscapes in poor condition. Streets identified in the 2000-2005 CIP include: N. Milpitas Boulevard, Escuela, West Calaveras Overpass, East Calaveras Boulevard, South Park Victoria, North Park Victoria, and Piedmont Road. South Abel and South Main Streets should be reviewed for inclusion in next year's CIP.
3. Gateway and Town Center entries identified in the 2000-2005 CIP focus on the city limits where the city can undertake improvements without extensive coordination with other agencies. These include: South Park Victoria, North Park Victoria, North Milpitas, and South Main Street. Freeway interchange gateways at I-680 and I-880 where the use of lands belong to Caltrans will need to be coordinated and undertaken in conjunction with their improvement schedule. Gateway treatments in the medians and surrounding lands adjacent to the freeway interchanges should be undertaken in conjunction with improvements of the adjacent streets (e.g. West Calaveras Boulevard)
4. Planting Strip Renovation Program in Residential Areas. Selection of areas for a pilot program should be identified by staff in conjunction with citizen groups and commission and council members.
5. Aged Tree Replacement Program in Residential Areas. Selection of areas for a pilot program should be identified by staff in conjunction with citizen groups and commission and council members.

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6. Soundwall Maintenance and Replacement. Selection of soundwalls for a pilot program should be identified by staff in conjunction with citizen groups and commission and council members.
7. Commercial Area Tree Replacement/Enhancement Program. Selection of areas for a pilot program should be identified by staff in conjunction with citizen groups and commission and council members.

E. Capital Improvement Program and Estimating Capital Costs

During the development of the Streetscape Master Plan, the 2001 Capital Improvement Program (CIP) recommendations were identified for the key projects. City staff, working with the task force and consultant team, prepared project descriptions and budgets. The CIP identifies improvements and implementation phasing over a five-year period.

The preliminary list of unit costs for Capital Improvement Program estimates (Figure 18) was identified to help staff with the development of future CIP budgets. The probable costs is based on year 2000 construction costs (materials, labor and contractor overhead/profit). The unit costs do not include design, administrative, survey, inspection, land or project specific costs such as requirements for traffic control, staging, and bonding. These project related costs should be added on during the CIP budgeting process.

	Item	Unit	Cost
Street Tree Planting			
1	Replace Street Tree Planting: 24" box tree, watering tubes, soil/ amendments, root barrier staking	per tree	\$ 922.00
	Add for: tree pit w/ structural soil (8 by 10 feet by 2 feet deep) @ \$50/ CY	per tree	\$ 296.30
	Street Tree Planting both sides per 100 LF at 50' o.c.(4 trees)	/100 LF	\$ 4,873.19
	Note: Add extra \$ for large tree removal and stump grinding		
	# of trees / mile @ 50 ft oc	106	\$ 128,652
2	New Street Trees Planting existing sidewalks with new 4 by 4 openings: sawcut concrete, 24" box tree, watering tubes, soil/ amendments, root barrier staking	per tree	\$ 1,007.00
	Add for: tree pit w/ structural soil (8 by 10 feet by 2 feet deep) @ \$50/ CY	per Tree	\$ 296.30
	New Street Tree Planting both sides per 100 LF at 50' o.c.(4 trees)	/100 LF	\$ 5,213.19
Median Planting			
3	Replant (e) median with new trees, shrubs & groundcovers, remove old plantings, clear & grub, amend soil, mulch	SF	\$ 5.42
	Median Replacment Planting per 100 LF w/ trees @ 50' oc		\$ 5,415.00
4	New median with removed asphalt/ base, new crubs, trees, shrubs & groundcovers, amend soil, mulch	SF	\$ 11.62
	Median Replacment Planting per 100 LF w/ trees @ 50' oc		\$ 11,615.00
Bulbouts into Parking Lane for Street Trees			
5	4 by 8 foot bulbouts. Remove curb/ gutter, asphalt/ base, install new curb and gutter, amend soil, trees, ground cover, and mulch	per bulbout	\$ 777.00
	Bulbout Plantings both sides (4 trees) per 100 LF space 50' oc		\$ 3,108.00
Planter Strips			
6	Replant 4 foot wide Planting Strips: Clear & grub, amend soil, new trees, shrubs & ground covers, & mulch	SF/ per side	\$ 4.43
	Replant 4 foot wide Planting Strips per 100 LF each side of street		\$ 1,770.00
7	New Planter Strips in Parking Lane: Remove alsphal/ base, curb/ gutter, install new curb/ gutter, amend soil, trees, ground cover and mulch	SF/ per side	\$ 38.29
	New 4 foot wide Planter Strips in Parking Lane per 100 LF each side of street		\$ 15,315.00
Gateway Treatments			
8	Major Gateway treatment	EA	\$ 75,000.00
9	City Entry Treatment	EA	\$ 50,000.00
Irrigation			
10	Street tree bubblers & laterals (two bubblers),	per tree	\$ 110.00
	Connection & Control Charges for Street Trees	per mile	
	Backflow unit / cage, Master valve, 24 station controller		\$ 10,500.00
	Add for Valves (remote control, gate & quick coupler) 1 per mile per side of St		\$ 1,700.00
	Add for Mainline trenching, backfill and street borings		\$ 43,440.00
	Street Tree Connection Charges per mile		\$ 55,640.00
11	Median spray heads & laterals (15' o.c. max head to head coverage)	SF	\$ 2.00
	Median Connection & Control Charges per mile (15' max width)		
	Backflow unit / cage, Master valve, 24 station controller		\$ 10,500.00
	Add for Valves (remote control, gate & quick coupler) 1 per sixth mile (800 LF)		\$ 10,200.00
	Add for Mainline		\$ 5,280.00
	Median Connection Charges per mile		\$ 25,980.00

Figure 18. Unit Costs for Capital Improvement Program Estimates

APPENDIX I

Technical Recommendations

Technical Recommendations

I. Site Analysis and Environmental Considerations

As streetscape projects move forward in the planning stage toward implementation, specific site characteristics will help define the final design of the project. The overall climate of Milpitas, irrigation needs, soil types and specialized microclimatic influences must be incorporated into the design of the streetscape.

A. Climate & Meteorology

The City of Milpitas lies in a climate zone that is characterized as a Northern California Coastal Thermal Belt¹. This climate zone is dominated by the Bay Area and coastal influences approximately 85% of the time and by inland weather about 15% of the time. This results in a mild climate that can grow a wide range of plant materials. The growing season is long, and hard winter freeze is rare.

A ten-year average of local rainfall data indicates that this area receives approximately 13.73 inches per year of precipitation². All other landscape water necessary for healthy plant growth must be provided by irrigation systems.

Evapotranspiration (ET_o) is a measurement of environmental conditions that affect plant water use. Factors such as wind, solar radiation, humidity, ground temperature, air temperature, and rainfall are regularly polled to determine plant water use that occurs through both evaporation and transpiration. Transpiration is water use that occurs as the plant tries to cool itself. Evaporation is the water that evaporates from the surface of the plant. This information is fed into a microcomputer and the raw data is converted into an ET_o number. ET_o values are now becoming very significant in the estimation and calculation of water needed by landscaping. A ten-year average of local ET_o data for the Milpitas area indicates that this area has an annual ET_o rate (known as ET_o) of 43.56 inches.

Based on the above mentioned average rainfall and ET_o data, approximately 29.83 inches of annual irrigation water would be required to provide for 100% replacement of water which is used or lost in

¹ United States Department of Agriculture Publication No. 1475 - USDA Plant Hardiness Zone Map and Lane Publishing Co., Sunset Western Garden Book, Climate Map.

² National Oceanic & Atmospheric Administration, 10-year average rainfall

the landscape.³ Further technical information regarding irrigation recommendations can be found in Section VI. Irrigation in this Appendix.

B. Soils

Landscape soils in Milpitas are moderately variable clay to clay-loams. Organic matter is relatively low and pH ranges from 6.9 to 7.2. Permeability is slow; the available water capacity is 7.0 to 9.5 inches. Runoff is medium, and the hazard of erosion is slight to moderate. Since the water intake range and permeability are slow, plant materials need to be watered slowly to reduce runoff. Shrubs and trees should be drip irrigated to encourage deep rooting; except drip systems should not be used with recycled water. Adding organic matter to the soil can improve the rate of water intake, aeration, and soil tilth.

Shallow localized soils vary in depth and quality. Early housing subdivisions that were constructed upon cultivated farmland resulted in areas of loose well draining soils. These have become the basis for good tree growth and development. On the average landscape trees and shrubs will be rooted within the top 18 inches to 24 inches of the surface.

During the design stage of project implementation, a sampling of soil and soil tests should be done for all planting areas to determine the optimum soil conditioning treatments prior to planting. The testing should identify both the physical and chemical characteristics of the soil and make recommendations for improvements. Testing will customize the general recommended procedures and provide specific quantities of amendments or conditioning agents to maximize healthy plant growth.

To improve planting conditions, excavate or deeply trench on either side of the proposed planting hole prior to planting a tree. A minimum distance should be equal to the eventual extent of the tree drip line (the drip line is the width of the mature tree canopy). The minimum depth should be 24 inches. This will likely result in the excavation of the full width of a typical parking strip, sidewalk or median. The excavation or deep trenching will greatly minimize compaction and initially improve drainage and aeration of the root zone. It is important to avoid excessive compaction of the root zone. The use of structural soil⁴ will also improve planting

³ The California Irrigation Management Information System (CIMIS) provides weather reports and irrigation information. This information can be accessed by the Internet at www.dpla.water.ca.gov.

⁴ Structural Soil is a scientifically designed soil mixture that can support pavement while providing a growing medium that allows for root penetration, water/ nutrients for healthy tree growth and adequate drainage. The three components of structural soil are crush stone, clay loam and a stabilizing hydrogel. Cornell University Urban Horticulture Institute has been testing and refining the specification for producing structural soils. Additional information including complete technical specifications can be obtained at their web site <http://www.cals.cornell.edu/dept/flori/uhi/specs.html>.

conditions by providing for the compaction needed to support pavement, but also by maintaining necessary structure for adequate root development.

Where reclaimed water is used, it is recommended that a sampling of soil tests and water quality tests are done every six months to ensure that any soil related salinity problems or decline in water quality can be mitigated before major loss of plant materials. Leaching, by applying additional water, is a common remedy to reduce salt build up. However, the soil's capacity to drain away excess water and salts needs to be determined before using this technique.

C. Microclimatic Influences

Environmental conditions can vary significantly within a streetscape. Structures and paving typical of urban landscapes can strongly influence foliar and air temperatures, wind, and humidity. For example, trees in parking lots are subject to higher temperatures and lower humidity than trees in large park areas. Selection of tree species, and appropriate adjustments to irrigation and maintenance schedules need to match the particular microclimatic demand of the area. Such factors should be considered when selecting species for planting in areas with considerable asphalt, concrete, or in close proximity to larger buildings.

D. Planting Space Requirements

Providing adequate planting space for street trees in public right-of-ways has been cited as an important factor in developing a healthy street tree and in minimizing tree-related concrete damage.⁵ There is currently no universally accepted formula to determine the amount of planting space for street trees to substantially minimize or eliminate concrete damage. (For more information on maximizing planting space see Section V. Minimizing Concrete Infrastructure Damage in this Appendix).

There are four key factors, which influence the tree planting space requirements in parkway strips.

1. Species selection - genetic characteristics such as rooting development, and buttress growth.
2. Soil environment - structural and textural properties, which influence water holding capacity and oxygen availability at varying depths.
3. Horticultural provision – the provision of supplemental water, fertilizer, and the general care provided to the street tree.
4. External influences - such as compaction due to pedestrian or vehicular traffic, physiological damage, etc.

⁵ Harris, University of California, Davis, 3rd edition, 1997; Barker, US Forest Service, 1990; Lindsay, Cornell University, 1990.

Although a specific correlation has not been made between the quality of the plant material (at the time of planting) and tree-related concrete damage, many arborists speculate that more healthy and vigorous plant material used at the time of planting influences the minimization of tree-related concrete damage. A well developed, healthy root system is essential to a vigorous plant, particularly to a tree that lives many years and becomes large. In a well-formed root system, branching is symmetrical and main roots grow down and out to provide trunk support.⁶

Root development in urban soils is influenced by the availability of water, nutrients, and oxygen. In the typical Milpitas sidewalk, median or parking strip configuration, root development is largely confined to the narrow planting area. As the tree develops, if the soil environment is unfavorable (i.e. compaction, deficiencies of water, nutrients, or available oxygen), roots may impose pressure on adjacent concrete or asphalt paving.

Contrary to popular belief, the soil environment beneath sidewalks apparently favors tree-root growth.⁷ The sidewalk, made of concrete, functions as a barrier against soil moisture loss by either evaporation or transpiration. In addition, the high moisture content of the soil, compared to the concrete, confers upon the soil a high specific heat. When the sidewalk warms, some of the heat radiates to the soil beneath it. Conversely, when the sidewalk cools, the temperature drops more rapidly than the soil, and the underside of the sidewalk becomes a surface for condensation of soil moisture which subsequently percolates back in to the soil.

Tree roots tend to grow where the soil environment is most favorable and, therefore, often grow at very shallow depths as they extend under a sidewalk. These shallow roots, which, like all roots, enlarge radially, eventually may cause upward displacement of adjacent sidewalks. This being the case, if additional emphasis is placed on enhancing the conditions of small planting areas, the parking strip, or medians (beyond the traditional planting hole area) it is possible that otherwise invasive roots will remain in the planting area. The use of structural soil will improve conditions by providing a favorable growing medium.

II. Key Principals of Urban Forestry for Sustainable Streetscape Development

Four key principals of urban forestry should be considered during project development to create a more sustainable streetscape.

⁶ Richard Harris, University of California, 3rd edition, 1997

⁷ Philip Barker, US Forest Service

1. *Use dominant, subdominant and accent trees species.*

Good urban forestry considers the use of dominant, subdominant and accent trees. The use of more than one species on a street or in a given area is recommended in order to avoid monocultures and to aid with rotational management. Dominant trees create the primary character of the street. When two dominant trees are chosen they should be used equally. Subdominant trees can be used at a ratio of one tree to every four to six dominant trees. Accent trees should be used for special areas. Accent trees could be used at the same ratio of subdominant trees – one tree for every four to six dominant trees.

2. *Avoid creating monocultures.*

Single species or monoculture plantings can become disastrous when a new disease or pest attacks that species. With monocultural planting the entire tree population reaches the end of its useful life at the same time, requiring complete replacement. It is not uncommon to plant the full length of a major street with a single species to create a unified character. However, a monoculture can be avoided by planting the adjacent streets with a different species and incorporating accent trees in medians and other special places. Alternate placement of several tree species can also take place by using different species within a block, or street segment or by using different species for different blocks. Alternating the placement of species within a block is more typical of a residential street where homeowners are given a choice of the street trees in front of their property.

3. *Plant for rotational management.*

Rotational management includes the deliberate mixing of trees with different species and ages that have different lifespans to create a range of useful life. This means the entire tree population will reach the end of its useful life at different times and therefore never require complete replacement. A multi-aged and multi-species planted streetscape more closely replicates what is found in a healthy ecological system.

4. *Incorporate the concept of useful lifespan into the management of streetscape plantings.*

Trees, as with all living beings, have a lifespan. The useful lifespan of a tree is the length of time that the tree can be expected to be healthy. The useful life of a tree is over at the age a tree species is known to decline, or to cause unacceptable problems such as excessive paving damage, increased pruning to remove dead limbs, or other maintenance issues. It is then best to remove the aged tree and replace it with a healthy young tree. The useful lifespan of tree species differ, and individual trees respond differently as they age. In general, the fast growing species have short useful lifespans of 25 to 30 years.

The slower growing species have longer useful lifespans up to hundreds of years. The lifespan is greatly influenced by the growing conditions of the individual trees. Less than optimum water, soil conditions or drainage can reduce the useful lifespan of a tree.

III. Street Tree Species Selection and Spacing Guidelines

A. General Tree Selection and Initial Tree Size

Many street tree master plans assign specific trees to specific streets. However, this one time assignment of a species can not always incorporate all of the conditions found on the individual streets. The variety of conditions in Milpitas require a more flexible approach that allow the designer to select from a list of recommended tree species to be able to find the right plant for each specific project. Overall design guidelines are discussed for major streets, residential, industrial and commercial areas in Section II. Street Plantings. These guidelines address considerations such as size of tree, growth rate, branching structure and required clearance. A Species Characteristic Table (Figure 21) identifies the mature height and shape as well as other species characteristics. As each streetscape project is developed, the project designer will use these tools to select appropriate tree and other plant species.

The initial quality of plant materials is key to enhancing the survival of street plantings. Plants need to be well established, with crown and root growth habits typical of their species. Trees should have straight trunks and a well developed terminal leader. The overall height, branching structure, size of crown and trunk caliper of trees should be in good balance and conform to the standards set by the American Association of Nurserymen in their American Standard for Nursery Stock (ANSI Z60.1). All plants need to be free of insects, disease, heavy abrasions or disfiguring injuries. Plants grown in containers should be inspected for root conditions. Rootbound plants with kinked, girdling or circling roots, or root systems that are broken or loose should not be accepted for planting. Larger tree sizes are available from nurseries either grown in boxes or as field stock that is sold "B&B" (ball and burlap). Larger trees not only enhance the character of the street more rapidly, but are also more resistant to vandalism and have the necessary vertical branching clearance to reduce damage from trucks and buses. Young trees that have been container grown in 5 or 15 gallon nursery cans are often used, as they are easy to transplant and relatively inexpensive. However, these small size trees can be easily damaged in a streetscape environment. The City Standard is that 24" box and 36" box trees be used on streetscape projects. Street trees should conform to the following specifications for size and height:

Recommended Initial Size Street Tree Standards

<i>Size</i>	<i>Height</i>	<i>Caliper Size</i> <i>(Trunk 6" above ground)</i>	<i>Minimum Diameter</i> <i>Root Ball for B&B</i>
36" Box	14' - 16'	2 1/2" - 3 1/2"	28" - 38"
24" Box	10' - 14'	1 1/2" - 2 1/2"	20" - 28"

In general, the tree species and size selection is a cooperative decision between property owners and city street trees division staff, except for the major streets. Trees must be selected from the official tree list and be adaptable to the conditions at the planting site. The following guidelines should also be considered in making the final determination.

B. Tree Spacing

Spacing of trees should be such that every interested property owner is allowed to have at least one street tree if planting site conditions permit. Lots vary in width and interfering factors such as streetlights, power poles, driveways, utilities and sight-lines. Safe traffic flow ultimately should determine the final spacing. In general, the recommended spacing should be equal to the mature canopy diameter (e.g. 50 foot mature canopy spread placed 50 foot on center). In some cases it will be desirable to create a continuous canopy effect and the trees will be spaced closer together so that canopy overlap of approximately one-third occurs.

Recommend Street Tree Spacing

<i>Mature canopy size</i>	<i>Typical Spacing</i>	<i>Spacing for Canopy Overlap</i>
20 - 30 foot canopy diameter	20 - 30 foot spacing	15 – 20 foot spacing
30 - 40 foot canopy diameter	30 - 40 foot spacing	20 – 25 foot spacing
40 - 50 foot canopy diameter	40 - 50 foot spacing	25 – 30 foot spacing

Several other site-specific considerations must also be taken into account during the final species selection. These include utility restrictions (overhead wires or underground utilities, vaults, hydrants), street lights and traffic safety considerations, such as at intersections, traffic control signs and informational signs. The condition of existing trees and success of species that exists in the surrounding vegetation on adjacent lands should also be reviewed to determine if continued use of the existing species should be recommended. The maintenance implications of selected species should also be evaluated to determine if the species can be sustained on a long-term basis.

C. Other Considerations by Street Type and Size

C1. Local residential streets less than 40 foot wide

Planting areas for street trees in neighborhoods are typically in planter strips between the curb and sidewalk. Where there are no planter strips, street or sidewalk modifications such as sidewalk cut outs or bulb outs into parking lanes for trees in the street should be evaluated. Another option on narrow streets where traffic volumes or parking requirements will not permit trees in the parking lanes is to request street tree planting easements in front yards. These may be formal easements or informal encouragement of city sponsored neighborhood planting on private property.

Appropriate trees include those of 15 - 30 foot or 30 - 50 foot height with an upright, round or pyramidal form such as shown in Figure 19:

- Acacia baileyana – Bailey's acacia
- Acer rubrum – Red maple
- Carpinus betulus – European hornbeam
- Celtis sinensis – Chinese hackberry
- Koelreuteria bipinata – Chinese flame tree
- Lagerstroemia indica – Crape Myrtle
- Pistachia chinensis – Chinese pistache
- Sapium sebiferum – Tallow tree
- Tilia cordata – Little leaf linden

C2. Collector and arterial streets 40 to 70 foot wide

These streets can be categorized as those with 2 lanes and parking, and those with 4 lanes and parking. Many of these streets have existing street trees located in planter strips or sidewalk cut outs. In some cases the existing trees have not thrived or an inappropriate species was selected, so that the trees are small and have little visual impact on the street scene.

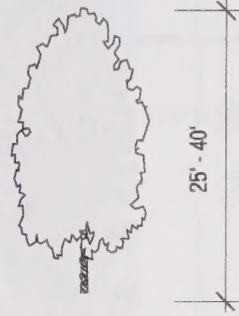
Street trees in these situations need to be larger in both height and width so that they are visually in scale with the increased width of paving. Where sidewalk cut outs exist, the project should evaluate the available root zone. If the existing planting space is 4 foot by 4 foot or less, consider removing an 8 by 10 feet portion of the sidewalk and replacing the sidewalk on a structural soil mix and a minimum size plant cut out of 3 foot by 3 foot.⁸ The street traffic demand should also be reviewed to see there is excess pavement that can be dedicated to additional planting areas. Opportunities for traffic calming and landscape treatments can include new medians, removal of a parking or travel lane to create or widen a planting strip, tree planting pockets in the parking lane, or neck downs at intersections.

⁸ Standard detail P-4 Treewell Detail depicts this recommended sidewalk replacement and use of structural soil.



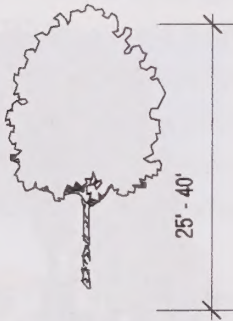
Flowering Cherry or
Flowering Plum

Small Flowering Trees



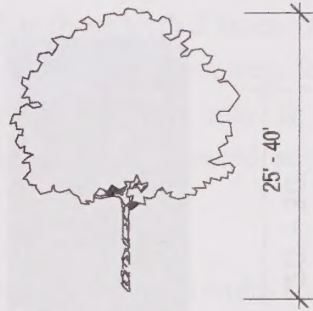
Eucalyptus

Pendulous Trees



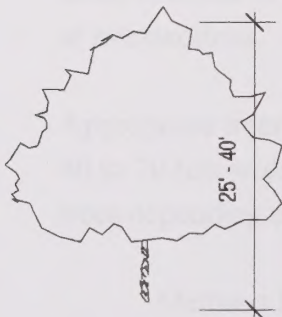
Bradford Pear

Medium Sized Oval Trees



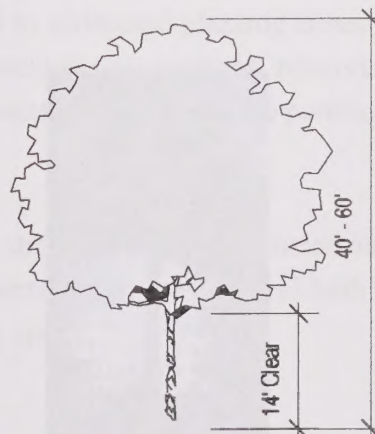
Southern Magnolia

Medium Round-headed Trees



Little leaf Linden

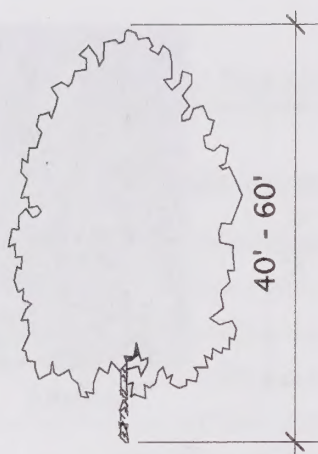
Medium Sized Pyramidal Trees



London Plane Tree

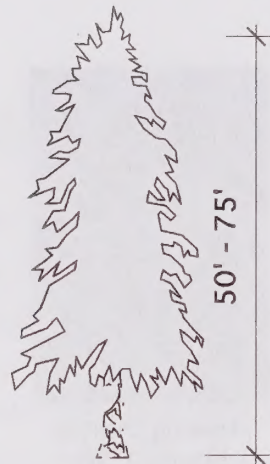
Large Round-headed Trees

Figure 19. Street Tree Shapes



Canary Island Pine

Large Columnar or Conical Trees



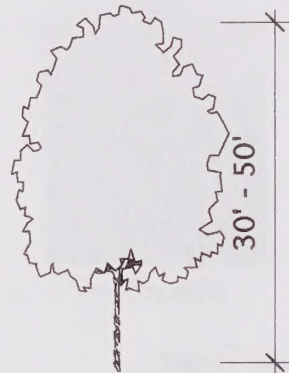
Deodar Cedar

Conical or Spire Trees



Crape Myrtle

Multi-stemmed Trees



Ash

Vase Shaped Trees



Canary Island Palm

Palm Trees

Figure 20. Street Tree Shapes (*continued*)

City of Milpitas Streetscape Master Plan

Appropriate trees include those of 30 foot to 50 foot height or above with an upright, round or pyramidal form such as:

Acer saccharinum – Sugar Maple
Celtus australis – European hackberry
Eucalyptus rudis Eucalyptus
Lirodendron tulipifera – Tulip tree
Pyrus calleryana – Bradford pear
Quercus rubra – Red oak

C.3 Streets greater than 70 foot wide with medians

Wider streets with medians can also be categorized as those with 2 lanes and parking, and those with 4 lanes and parking. Many of these streets have existing street trees located in medians, planter strips, planting areas behind the sidewalks or sidewalk cut outs. In some cases the existing trees have not thrived or an inappropriate species was selected, so that the trees are small and have little visual impact on the street scene.

Street trees in these situations need to be larger in both height and width so that they are visually in scale with the increased width of paving. Where sidewalk cut outs exist, the project should evaluate the available root zone. If the existing planting space is 4 foot by 4 foot or less, consider removing a portion of the sidewalk and replacing it with a structural soil mix and a minimum size plant cut out of 8 by 10 feet. The street traffic demand should also be reviewed to see if there is excess pavement that can be dedicated to additional planting areas. Opportunities for traffic calming and landscape treatments can include new medians, removal of parking or travel lanes to create or widen a planting strip, tree planting pockets in the parking lane, or chokedowns at intersections.

Appropriate trees for use along the side of the streets include those listed above for streets from 40 to 70 feet wide. The medians offer the opportunity to use a mix of both small trees and larger trees depending upon the width of the planting space.

Medians 12 foot wide or less.

These narrow medians require the use of street trees similar to the list for the sides of the street. However the trees may also include the broad spreading species that can be limbed up for vertical clearance such as:

Aesculus carnea	Horse chestnut
Albizia julibrissin	Silk tree
Ginkgo biloba	Ginkgo tree
Magnolia grandiflora	Southern magnolia
Platanus acerifolia	Sycamore

Medians greater than 12 foot wide.

The wide medians allow for the introduction of trees that spread to the ground such as:

Cedrus deodar Deodar cedar

Sequoia sempervirens Redwood

These can be used in conjunction with the smaller trees for accents such as

Prunus serrulata Flowering cherry tree

IV. Existing City Tree List and Recommended Shrubs,

Groundcovers and Vines

Given the relatively good climate and poor soil conditions of Milpitas, most species listed will perform generally well in the area. However there is one variety of tree that should be removed from the list or restricted to specific uses. Purple leaf plum, *Prunus cerasifera* "Thundercloud" has a high pest potential, especially under water stress conditions, and undesirable fruit development

The recommended city tree list has been augmented with several species that are horticulturally suitable for the City of Milpitas. Characteristics tables of trees, shrubs, groundcovers and vines (Figures 21 and 22) have been created to provide additional information and make appropriate selection of plant materials easier. The table includes water needs and maintenance intensity.

Recommended additions include:

<i>Botanical Name</i>	<i>Common Name</i>
<u>For planting in areas 3 feet wide or less</u>	
<i>Callistemon viminalis</i>	Weeping Bottlebrush
<i>Carpinus betulus</i> 'Fastigiata'	Fastigate Hornbeam
<i>Cercis canadensis</i>	Eastern Redbud
<i>Crataegus phaenopyrum</i>	Washington Hawthorn
<i>Lagerstroemia indica</i> 'Muskogee'	Muskogee Crape Myrtle
<i>Lagerstroemia indica</i> 'Tuscarora'	Tuscarora Crape Myrtle
<i>Malus</i> 'Robinson'	Robinson crabapple
<i>Maleleuca linariifolia</i>	Flaxleaf Paperbark
<i>Metrosideros excelsus</i>	New Zealand Christmas Tree
<i>Tristania conferta</i>	Brisbane Box
<i>Tristania laurina</i>	Swamp Myrtle
<u>For planting in areas more than 3 feet wide</u>	
<i>Acer freemanii</i>	Hybrid Maple
<i>Aesculus carnea</i>	Red-Flowering Horsechestnut

[illegible]

SHRUBS, GROUNDCOVERS & VINES		Evergreen	Deciduous	Low - Up to 12"	Short 18 - 24"	Medium - 36"	Tall - over 48"	Open	Medium	Dense	Round	Arching	Oval	Upright	Spreading	Flat mat	Slow	Moderate	Rapid	Fine	Medium	Coarse	Drought	Wind	Shade	Recycled Water (#) Salt tolerant	Low	Moderate	High	Short Lived	Moderate	Long-lived	Aromatic	Attracts Birds/ Butterflies	Flake * Flower * Leaf * Bark	Fall Color	Screening/ Barrier	Clean * Neat	Needs Well Drained Soil	Does not Tolerate Shearing	
Common Name	Botanical Name	Type	Height																																						
SHRUBS																																									
Abelia grandiflora	Glossy Abelia	*		*					*		*		*				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Arbutus unedo	Strawberry Tree	*			*			*						*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Acanthus mollis	Bear's Breach	*		*					*					*	*				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Agapanthus africanus	Lily of the Nile	*		*	*				*					*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Arctostaphylos cultivars	Manzanita	*		*	*	*		*						*	*	*	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Berberis thunbergii	Japanese Barberry	*			*			*						*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Buddleia davidii	Butterfly Bush	*	*					*				*		*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Carpenteria californica	Bush anemone	*	*		*			*			*						*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Ceanothus species	Wild Lilac	*		*				*						*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Cercis occidentalis	Western Redbud	*		*		*		*						*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Chaenomeles cultivars	Flowering Quince	*		*		*		*						*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Cistus species	Rockrose	*		*	*			*		*	*			*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Cotinus coggygria	Smoke Bush	*	*		*	*		*						*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Cotoneaster lacteus	Red Clusterberry	*		*		*		*			*			*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Dietes bicolor or vegetata	African Iris	*		*				*						*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Escallonia exoniensis	Escallonia	*		*	*			*		*	*			*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Euryops pectinatus	Gold Shrub Daisy	*		*	*			*		*			*				*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Feijoa sellowiana	Pineapple Guava	*		*				*						*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Fremontedendron hybrids	Flannel Bush	*		*		*		*						*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Heteromeles arbutifolia	Toyon	*		*	*	*		*						*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Kniphofia uvaria	Red Hot Poker	*		*				*		*	*			*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Myrsine africanum	African Box	*		*		*		*		*				*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Myrtus communis	Myrtle	*		*		*		*		*	*			*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Nandina domestica 'compacta'	Heavenly Bamboo	*		*				*		*	*			*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Nerium oleander	Oleander	*		*		*		*		*			*				*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Phorium tenax	New Zealand Flax	*		*		*	*	*						*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Photinia fraseri	Fraser Photinia	*		*		*		*				*		*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Raphiolepis indica	India Hawthorn n	*		*		*		*		*	*			*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Sollya heterophylla	Australian Bluebell	*		*		*		*		*				*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Viburnum tinus 'Spring bouquet'	Spring Bouquet Viburnum	*		*		*		*		*			*				*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Xylosma congestum 'compacta'	Shiny Xylosma	*		*		*		*		*				*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
GROUNDCOVERS																																									
Acacia redolens	Prostrate acacia	*		*				*		*				*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Arctostaphylos 'Point Reyes'	Point Reyes Manzanita	*		*				*		*				*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Baccharis pilularis 'Twin Peaks'	Dwarf Coyote Brush	*		*				*		*				*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Ceanothus rigidus " Snowball"	Snowball Manzanita	*		*		*		*		*				*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Ceratostigma plumbagoides	Dwarf Plumbago	*		*				*		*				*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Coprosma kirkii	Creeping Coprosma	*		*				*		*				*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Correa 'Carmine Bells'	Australian Fuchsia	*		*				*		*				*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Gazania hybrids	Gazania	*	*	*				*		*				*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Hemerocallis species	Daylily	*	*	*				*		*			*				*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Lanata montevidensis	Trailing Lantana	*	*	*				*		*				*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Limonium perezii	Sea Lavender	*	*	*				*		*			*				*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Mahonia aquifolium 'compacta'	Compact Oregon Grape	*		*				*		*				*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Plumbago auriculata	Cape Plumbago	*		*		*		*		*	*			*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Ribes viburnifolium	Evergreen Currant	*		*		*		*		*	*			*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Rosemarinus officianalis	Spreading Rosemary	*	*	*				*		*				*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Santolina virens	Green Lavender Cotton	*	*	*				*		*				*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
VINES																																									
Clytostoma callistegioides	Lavender Trumpet vine	*						*		*				*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Disticus bucinaatoria	Blood Red Trumpet Vine	*						*		*				*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Gelsemium sempervirens	Carolina jessamine	*	*					*		*				*			*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Jasminum polyanthum	Pink Jasmine	*	*					*		*																															

Figure 22. Species Characteristics Table (Continued)

City of Milpitas Streetscape Master Plan

<i>Celtis australis</i>	European Hackberry
<i>Eucalyptus microtheca</i>	Flodded Box
<i>Geijera parvifolia</i>	Australian Willow
<i>Ginkgo biloba</i> 'Autumn Gold'	Autumn Gold Ginkgo
<i>Koelreuteria paniculata</i>	Goldenrain Tree
<i>Koelreuteria bipinnata</i>	Chinese Flame Tree
<i>Metrosideros excelsus</i>	New Zealand Christmas Tree
<i>Pittosporum undulatum</i>	Victorian Box
<i>Podocarpus gracilior</i>	Fern Pine
<i>Pyrus calleryana</i> 'Aristocrat'	Aristocrat Pear
<i>Prunus cerasifera</i> 'Krauters Vesuvius'	Flowering Plum
<i>Quercus coccinea</i>	Scarlet Oak
<i>Quercus suber</i>	Cork Oak
<i>Quercus agrifolia</i>	California Live Oak
<i>Quercus ilex</i>	Holly Oak
<i>Sapium sebiferum</i>	Tallow Tree
<i>Tilia cordata</i> 'Chancellor'	Little-Leaf Linden

Fruit producing trees require high maintenance for optimum health. They require good soil, typically higher levels of water, and more frequent maintenance for pest control and harvesting of the fruit. They should only be used in areas where dropping fruit and low branches do not create hazards to pedestrian or vehicles.

The recommended list of shrubs, vines and groundcovers has been developed as a starting point for final design selection. These species are well adapted to the environmental conditions in Milpitas, and are generally drought-tolerant, requiring low levels of maintenance. The characteristic table provides additional information to make appropriate selection of plant materials easier. Other species should be considered as this short list is not a complete compilation of appropriate plants.

V. Minimizing Concrete Infrastructure Damage

The 1992 California Community and Urban Forestry Survey⁹ stated that approximately half of the cities and counties who responded to a 1988 survey reported that they had stopped planting certain tree species because of undesirable root growth characteristics. Trees with invasive root systems have been identified on the Species Characteristics Table (Figure 21) and should not be used in areas with limited planting space for root development.

⁹ California Department of Forestry and Fire Protection, released in December 1993.

City of Milpitas Streetscape Master Plan

Concrete damage by street tree roots to public sidewalks, curbs, and gutters is a major problem, costing U.S. cities an estimated \$100,000,000 annually.¹⁰ The problem is exemplified through the experiences of several cities in the San Francisco Bay Area. One city appropriated \$500,000 annually to repair root-damaged sidewalks and curbs in an effort to avoid litigation by persons seeking compensation for injuries sustained from tripping or falling over damaged pavement. Another city appropriated \$1,000,000 for the same purpose. A third city needed to make similar repairs but, because of a limited tax base, was unable to do so and faces the possibility of litigation should concrete damage related injury occur. Another city considered whether to engage a contractor to trench along sidewalks to cut potentially offending roots on 11,000 trees, at a direct cost to adjacent property owners of \$300 per tree in 1991 dollars, or else to have the effected property owners replace each of these trees. The City of Milpitas budgets \$125,000 to \$150,000 annually for sidewalk repair.

Concrete damage on sidewalks, curbs, gutters, and driveways consist of the following types:

1. Vertical separation or displacement
2. Vertical rise or ramping
3. A hole or opening in a break or construction joint
4. The breaking away or spalling of concrete

Based on a survey of municipalities, the following severity criteria are often used to determine when concrete requires repair. The City of Milpitas has a higher standard of repair than many cities, as shown in the table below:

TYPE OF CONCRETE DAMAGE	CITY OF MILPITAS RANKING OF SEVERITY OF DAMAGE	TYPICAL RANKING OF SEVERITY OF DAMAGE	REPAIR OPTIONS
Slight Damage	less that 1/2 inch vertical offset	less that 1/2 inch vertical offset	None required - monitor
Minor Damage	1/2 inch - 3/4 inch vertical offset	1/2 inch - 1-1/2 inch vertical offset	Grind or Patch
Major Damage	3/4 inch or more offset or serious defects	1-1/2 inch or more offset or serious defects	Replace concrete

¹⁰ Phil Barker, ISA Research Summit White Paper, 1991.

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In related tree inventories and surveys conducted in the east and south Bay Area, 70% of the damaged concrete locations were adjacent to street trees.

Previous studies and surveys¹¹ indicated a strong relationship between the selection of street tree species and concrete damage. Wagar and Barker¹² found that in the East Bay area of San Francisco, where three and four feet wide tree and lawn planting areas predominate, sidewalk damage was less with smaller tree species such as cultivars of purple leaf plum (*Prunus cerasifera*). It was more serious, as expected, with abundant plantings of large-sized species, such as the popular sweetgum (*Liquidamber styraciflua*).

Since damage to sidewalks is preceded by shallow root growth, keeping roots away from sidewalks, or as deep as possible when they pass under the sidewalk should be a key objective. Among various strategies that may effectively separate tree roots from sidewalks, one strategy is the promotion of extra-deep rooting, given favorable soil conditions. Barker suggests possibilities for promoting deep-rooting include selecting a.) species with inherently deep roots, b.) unique phenotypes with unusually deep roots, or c.) trees whose roots are molded, during nursery production, into a columnar rootball to facilitate planting the roots (that are at the bottom of the root ball) exceptionally deep. In 1983, Richard Harris¹³ reported that root growth varied with tree species, soil conditions, surface covering, rainfall, and irrigation practices. Although it is generally accepted that certain species may be more prone to cause concrete damage, no empirical studies have provided a comprehensive list of species that are successful in all cases. Selection of a particular species is only one of several factors associated with minimization of concrete damage in the urban setting.

According to the 1992 State of Urban Forestry in California report,¹⁴ root barriers were being used by about 60% of the survey respondents as compared to 50% in 1988. Many Bay Area cities have adopted a policy of installing root barriers for trees with known tendencies for root damage. Although this is the case, empirical research is inconclusive as to the long-term benefits of the use of root barriers.

Additional study at the University of California San Jose Field Station by Dr. Lawrence Costello¹⁵, and at the Solano County Research facility, by Dr. Phil Barker¹⁶ is seeking to measure the efficacy of root barrier materials.

¹¹ The State of Urban Forestry in California, 1992; League of California Cities, 1988.

¹² Wagar, J. Alan, and Barker, Phillip A. 1983. Tree Foot damage to sidewalks and curbs. Jour. Arbor. 9(7):177-181.

¹³ Richard W. Harris, University of California, Davis, 3rd edition, 1997.

¹⁴ California Department of Forestry and Fire Protection, Urban Forestry Program.

¹⁵ Extension Advisor, University of California Cooperative Extension, San Mateo and San Francisco Counties.

¹⁶ Horticulturist, Pacific Southwest Forest & Range Experiment Station, Forest Service, U.S. Department of Agriculture,

Initial observations from the above mentioned research projects indicates some short-term benefits when root barriers are installed at the time of planting. However, there is no local research relating to the efficacy of root barrier installation in relation to root pruning and curb, gutter, and sidewalk replacement of tree-damaged concrete.

Roots typically grow radially and horizontally through the soil, and most occur within the upper 6-12 inches of soil. If a root tip encounters an unmovable obstacle, it is deflected laterally. Once it grows around the obstacle, it will resume its original radial growth pattern. If deflected for a sufficient distance, it will assume a new direction of growth determined by the barrier. If a deflected root tip encounters another blockage that would induce deflection back toward the tree base, it grows downward. When it clears the lower limit of the blockage, it again grows in a radial direction. It is this combination of response patterns that is regulated by root barriers so as to induce root growth at deeper levels in the soil.¹⁷

If a root is pruned, numerous new roots develop a short distance back from the cut, and some from small, intact roots in the vicinity of the severed root. Usually only one or two of the regenerated roots will develop into a major root to replace the severed root. However, new root development is accelerated more or less proportionally to the amount of tissue removed in the pruning operation. If a large root is pruned to check its effect on a sidewalk, and if no (root) barrier is installed to deflect newly forming roots, rapid growth of regenerated roots can recreate the original hardscape problem within two to three years.

Mr. Gordon Mann, a noted arborist and city administrator¹⁸, has for the past decade administered a city-wide program to repair and replace damaged concrete curbs, gutters, and sidewalks in Redwood City. Researchers throughout the industry have closely monitored Mr. Mann's work. Mr. Mann attempts to provide a maximum amount of planting space for existing trees by realigning curbs, gutters, and sidewalks whenever possible. Additionally, after roots are pruned, root barriers are installed to deflect new root growth away from paving.

Analysis suggests that root barrier installation is a minimal cost item when performed in combination with root pruning, and replacement of concrete. Existing information suggests root barrier materials offer at least short term minimization of concrete damage, and may in fact offer much longer term benefits if used in combination with improved cultural practices such as deep-root watering and soil aerification. The city therefore should consider the use of root barriers as one of many tools in the arsenal for control of concrete damage.

Berkeley, CA.

¹⁷ Dr. Alden Kelley, Consulting Arborist, 1987.

¹⁸ City of Redwood City, California.

A. Alternative Sidewalk Configurations to Maximize Planting Space and Reduce Sidewalk Damage from Tree Roots

More space can be created for an existing or new street tree by realigning the sidewalk to an alternative curb, gutter and sidewalk configuration. The extent to which the curb, gutter, and sidewalk can be realigned depends on the width of the public right-of-way as well as other engineering and safety considerations. In those instances where there is an insufficient amount of right-of-way to realign the curb, gutter, and or sidewalk, property owners may grant a sidewalk easement.

An alternative configuration can allow the placement of new trees behind the sidewalk instead of between the sidewalk and curb. This allows relatively unrestricted root development into the abutting landscape much like a monolithic configuration.

A third alternative is to use porous materials instead of concrete as the sidewalk surface. Materials such as decomposed granite, interlocking pavers, and even rubberized resilient surfacing materials can be used. Note that sidewalk width and the use of alternate materials must be in compliance with the Americans with Disabilities Act (ADA). The use of alternative construction materials should allow for less compaction, and greater movement of water and exchange of gases (CO₂ and O₂) necessary for healthy tree growth.

B. Paving Around Street Trees and Planting in Existing Tree Pits

It is best where practical to avoid paving around the planting zone of street trees. If a walkable surface is required, permeable materials such as decomposed granite, interlocking pavers or alternative materials are the best solution to ensure healthy plant growth. Tree grates also permit a permeable surface at the trunk, but do not allow for a large area of permeable surface around their root zone and should be combined with the use of structural soil.

If a sidewalk or other paving material is proposed within four feet of a tree planting, use structural soils that can obtain the desired compaction levels for an engineered base without sacrificing free movement of water, nutrients and gases necessary for plant growth. A standard detail has been developed to install a minimum zone of 8 by 10 feet of structural soil to support a street tree. (See P-4 Treewell Detail in Appendix III.)

When replacing trees in existing tree pits, consider using structural soil mixes or alternative sidewalk configurations that provide adequate space for tree growth. Many of the existing tree pits are 3 feet by 3 feet wide or 4 feet by 4 feet wide. This is an inadequate soil volume for the

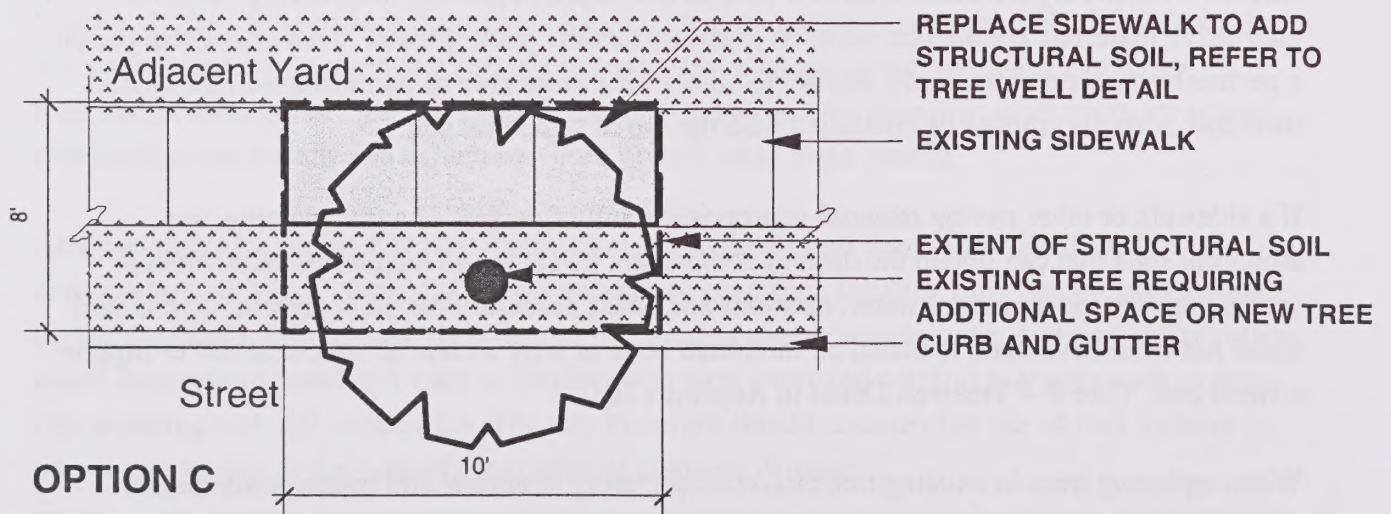
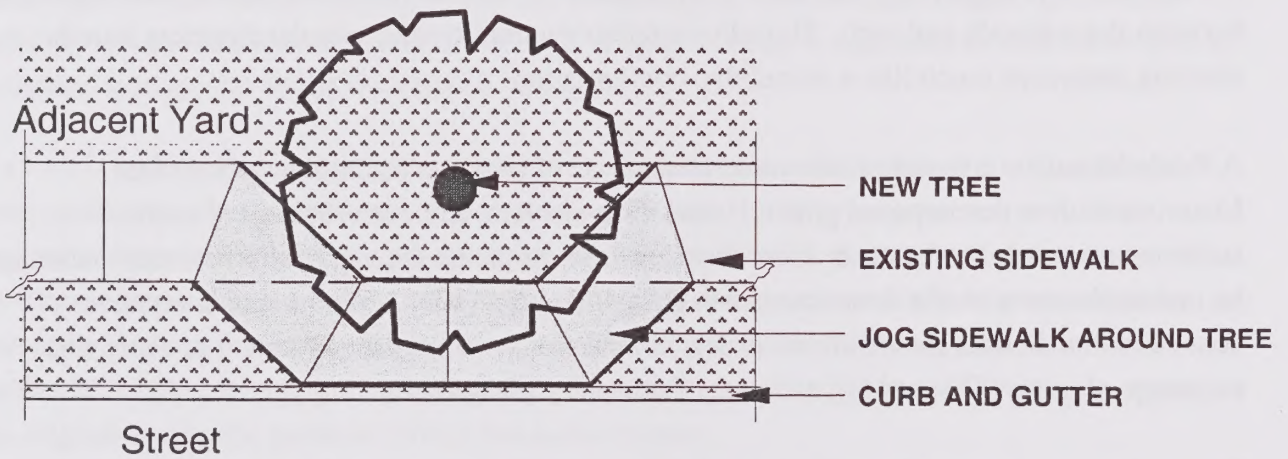
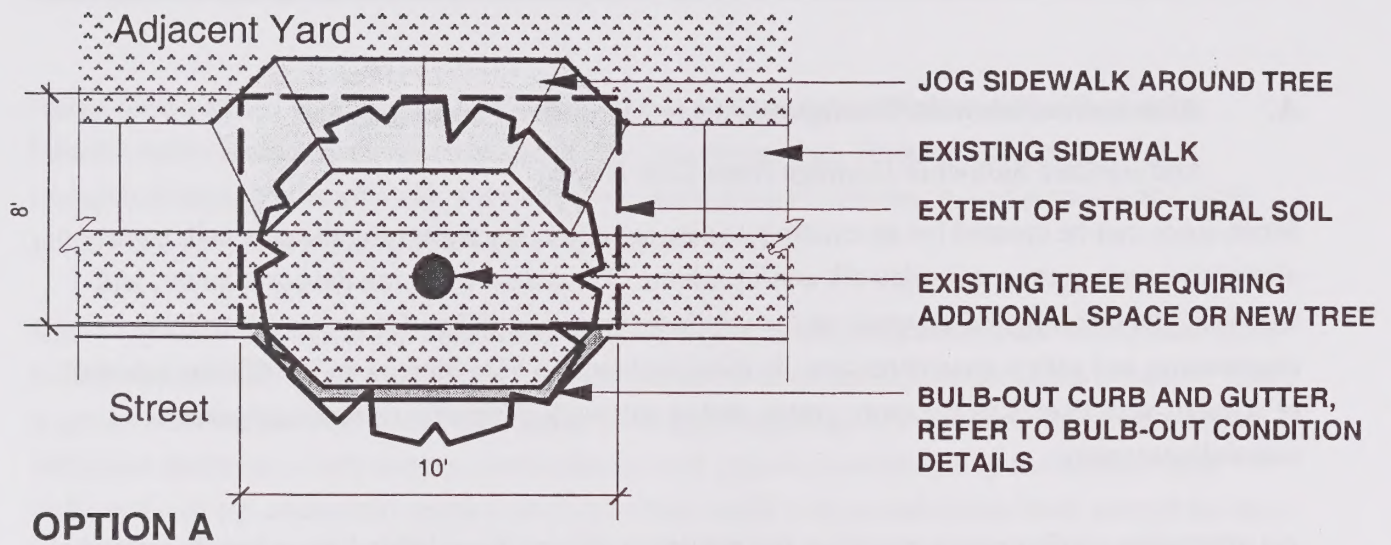


Figure 23. Alternative Sidewalk Configurations

healthy growth of most medium to large tree species. There are several approaches that can be used as shown in Figure 22:

- Remove an 8 by 10 feet portion of the concrete sidewalk and replace the soil with a structural soil mix that can support both paving and healthy tree development. Replace the concrete sidewalk leaving the minimum of a 4 by 4-planting opening.
- Jog the sidewalk or curb to create a larger planting area.
- Evaluate an alternative surface material for the sidewalk. Decomposed granite, interlocking pavement or rubberized resilient surfacing materials all allow less compaction and provide for a greater exchange of gases and movement of water. Obtain easements from adjacent property owners to be able to plant behind the sidewalk where there are less restrictions on root growth.
- If the above approaches are not feasible evaluate using a tree with a smaller mature size or plan on a higher level of maintenance and paving replacement for the larger tree species.

VI. Irrigation

A. Existing Irrigation Systems and Water Conservation Practices

Existing irrigation systems within the City of Milpitas consist of broad mix of different equipment, installation techniques, and a variety of ages. Due to these facts, it is difficult to have any consistency in the systems. Consistency is the key to conserving water, reducing maintenance time and creating a system that can be operated efficiently. The implementation of the new Rainmaster Evolution central control computer system is the foundation for achieving these goals. All new projects must be specified with compatible field equipment, including radio transmission. Performing evaluations of the existing systems to determine what equipment is salvageable and upgrading irrigation controllers and out of date equipment is the an integral part of creating a consistent system.

Due to the ever increasing demand on the potable water supply, the use of recycled water is a major resource in water conservation practices. The City of Milpitas has a network of existing and proposed recycled water lines throughout the city as shown in Figure 24. Connection to these lines should be utilized. As required in Title VIII Public Works Chapter 5 Water Efficient Landscapes of the Municipal Code, all irrigation projects that are located adjacent to existing or future recycle water lines should use recycled water.

Another way that water conservation can be achieved is by installing specific irrigation system components that have certain specialized functions to manage water and prevent water waste.

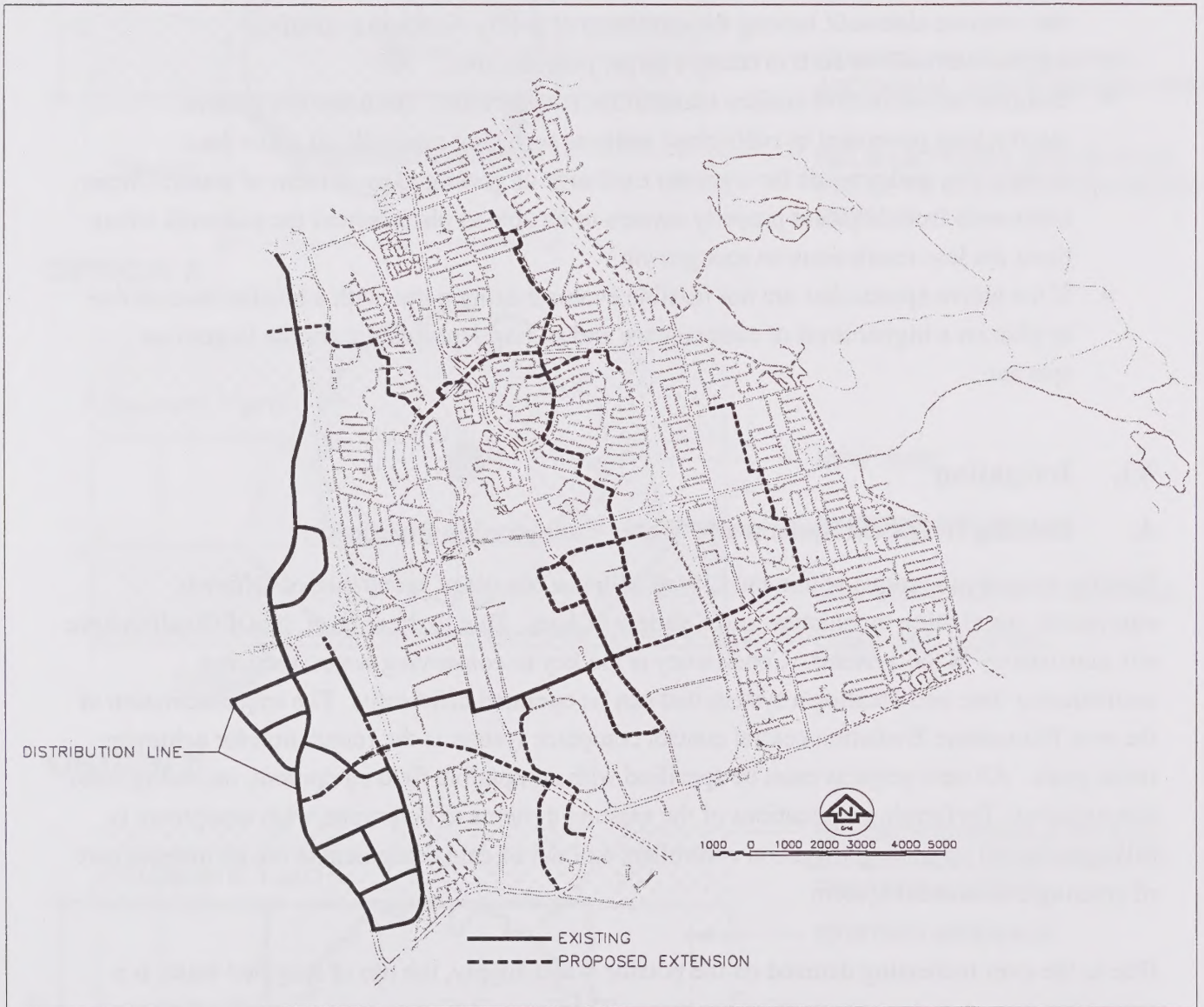


Figure 24. Recycled Water Pipeline Alignment

As of Jan. 12, 2000

For example, the use of a flow sensor and master control valve is a valuable tool. The flow sensor is capable of learning normal flows related to each specific zone of an irrigation system. If an abnormal flow occurs, such as a higher than normal flow rate, the system will shut down that particular zone due to the fact that there must be a broken line in that zone. Once a zone is shut down, a message is sent via the central control system to alert maintenance personnel of a problem that needs to be addressed, preventing water from being wasted. In the case of a main line break, the flow sensor will register a flow that is abnormal and shut down the master valve. Maintenance will also be notified so the repair can be made, again preventing water from being wasted.

B. Salvage and Reuse of Existing Irrigation Components

Prior to upgrading an existing irrigation system, it is important to evaluate it and determine what is salvageable and what should be removed. Due to the wide variety of existing systems, each one should be evaluated independently following these guidelines.

B1. Water Service

Determine if there is an existing potable or recycled water meter at the site. Identify the size of the service line and meter to determine if it will be of sufficient size to provide enough water to the project. Identify if there is an existing or proposed recycled water transmission line adjacent to the project. If so, a recycled water meter will need to be installed if the existing meter is not marked as suitable for recycled water.

B2. Irrigation Controller

If there is an existing irrigation controller at the site it will need to be evaluated for compatibility with the city's central control system. If the controller is not compatible it will need to be replaced or upgraded. The presence of an existing controller usually indicates that there is electrical service at the site that can be utilized for the project even if the existing controller can not be reused.

B3. Remainder of Equipment

A thorough inspection of the remainder of equipment is advised to see if it is in good working condition. Age and construction material will also help determine whether complete replacement is necessary (i.e. if sprinklers are on galvanized risers, leaking, or broken). If recycled water is currently not at the site, but is planned in the future, all of the remainder of the equipment should be replaced. Recycled water requires the use of specifically marked water pipe and equipment to avoid potential health hazard exposure to maintenance personnel or the public.

C. Locating New Equipment

Locations of equipment have health and safety issues and visual impacts. While each project will be different, use the following guidelines to determine the location of the two major above ground components.

C1. Backflow Prevention Devices

Backflow prevention devices shall be located as close as practical to the user's connection to prevent any connection prior to the backflow unit. However, the backflow prevention device can be located away from the water meter as long as it is demonstrated that no easily installed connectors between the water meter and backflow assembly would be possible. It is preferable to locate the backflow prevention device in inconspicuous places, such as in planting beds, where it can be screened by plant materials and painted to blend with the surrounding landscape.

C2. Irrigation Controllers

Irrigation controllers shall be located in an area which allows easy access for maintenance issues, but not in an area which would make a negative visual impact (i.e. at an entry way).

D. Design of New Irrigation Systems

A professional irrigation consultant using the irrigation design criteria listed in Chapter 5 Water Efficient Landscapes of the Municipal Code should design irrigation systems. Zoning or dividing of irrigation systems should take into consideration slope, soil type, solar aspect, wind, and plant material water requirements (hydrozones), as well as choosing the correct equipment for different sizes and shapes of these planting areas. Tree well cut-outs shall use bubbler irrigation at trees. Parkway strips shall use strip spray heads for turf areas and stream spray bubblers for shrub areas (planting areas 4 foot wide). All narrow planting areas using spray heads shall be designed with appropriate nozzles to prevent overspray onto adjacent surfaces to eliminate excessive run-off. Narrow planting areas and medians (up to 8 foot wide) shall use pop-up spray heads with appropriate nozzles for lawn areas, and stream spray bubblers for shrub areas. Wider planting areas and medians (wider than 8 foot) shall use pop-up spray heads with appropriate nozzles. Top of slope areas should also be valved separately from bottom of slope areas for optimal control.

E. Maintenance of Irrigation System

Establishing a regular maintenance schedule is a key ingredient to a successful water efficient irrigation system. A regular maintenance schedule shall include, but not be limited to, fine tuning of irrigation programming schedules (central control system will adjust this automatically with some guidance), and checking, adjusting and/or repairing the system with equipment equal

<u>ITEM</u>	<u>MANUFACTURER</u>	<u>WATER TYPE</u>
REDUCED PRESSURE BACKFLOW ASSEMBLY	WILKINS 975XLSEU	P
BACKFLOW ENCLOSURE (INSULATED STAINLESS STEEL)	STRONG BOX SBBC-ALI	P
SATELLITE CONTROLLER ASSEMBLY (BY ETS)	RAIN MASTER EVOLUTION	P, R
FLOW METER/MASTERVALVE ASSEMBLY (BY ETS)	FSAV	P, R
PRESSURE REDUCING VALVE/ FILTER ASSEMBLY	WILKINS 500 YSBR	P, R
QUICK COUPLER	RAIN BIRD 33 DNP	P, R
GATE VALVE	NIBCO T-113 IRR	P, R
REMOTE CONTROL VALVE	RAIN BIRD EFB-CP	P, R
POP-UP SPRAY SPRINKLER (LAWN)	TORO 570Z-4P-COM	P, R
POP-UP SPRAY SPRINKLER (SHRUB)	TORO 570Z-12P-COM	P, R
POP-UP ROTARY SPRINKLER (LAWN)	HUNTER PGP	P, R
POP-UP ROTARY SPRINKLER (SHRUB)	PGH	P, R
BUBBLERS (TREE OR SHRUB)	FB-50-PC	P, R
MAIN LINE	SCHEDULE 40 PVC	P
LATERAL LINE	CLASS 200 PVC	P
SLEEVING	CLASS 200 PVC	P, R
MAIN LINE (PURPLE)	SCHEDULE 40	R
LATERAL LINE (PURPLE)	CLASS 200	R

P= POTABLE, R= RECLAIMED

NOTE: ALL EQUIPMENT LISTED ABOVE SHALL HAVE APPROPRIATE PURPLE COLOR AND RECYCLED WATER WARNINGS WHEN INSTALLED IN RECYCLED WATER SYSTEMS.

Figure 25. City Standard Irrigation Equipment List

to originally specified materials. Landscape irrigation audits shall be in accordance with the State of California Landscape Water Management program and performed by a certified landscape irrigation auditor at the completion of a new project, and conducted a least once every five years.

VII. Use of Recycled Water

A. Soil Factors

Soils vary widely in the physical and chemical properties relevant to successful effluent water irrigation of plants. Coarse-textured soils such as sandy loams are best for the use of reclaimed water. Heavy-textured soils, as generally found in Milpitas, must be modified and monitored to allow for optimum plant growth, and the leaching of salts. If follow-up monitoring and adjustments are not done on a routine basis, salts and other toxic elements may accumulate in the rooting-zone of plant materials causing poor growth or premature death.

The soil water holding capacity is important in determining its suitability for reclaimed water irrigation. Frequent application of reclaimed water on soils with high water holding capacity, such as clay soils, will contribute significantly to their accumulation of salts and heavy metals. Shallow soils overlaying rock, hard pan, or clay pan restrict water percolation and drainage. The resultant perched water tables will promote accumulation of soluble salts and toxic ions.

B. Irrigation System Factors

When using recycled water, in-line filters and flush-valves are typically needed because of potential clogging of sprinkler nozzles due to algae or precipitates in the water. The designed irrigation system should allow the landscape manager to thoroughly and uniformly distribute water to the landscape in such a manner to leach accumulated salts from the root zones of the plant material.

C. Constituents of Recycled Water

The chemical and biological constituents of effluent water are important in using such waters for turf and landscape irrigation. In most cases, the wastewater has gone through an advanced treatment process and is suitable for turfgrass and landscape irrigation. Nevertheless, because effluent waters do contain impurities, careful consideration must be given to each situation to evaluate possible long-term effects on soils and plants from the treatment. The most common water quality problems associated with the use of low quality effluent water are:

C1. High Salinity

Salinity problems occur when the total quantity of soluble salts in the water is too high.

C2. Permeability

Reduced soil permeability problems occur if effluent water contains high levels of sodium.

Relative permeability is often expressed as SAR (Sodium Adsorption Ratio), the ratio of sodium to calcium and magnesium. A high ratio - above 9 - indicates potential permeability problems. Sodium concentration is an important factor in reclaimed water quality. Although high levels of sodium may accumulate in grasses and other plants and become toxic, it is the indirect effect of sodium on plant growth via its deteriorating effect on soil structure, which is of concern to turf and landscape managers.

High reclaimed water sodium content causes deflocculation of the soil clay particles, which in turn severely reduces both soil aeration and water infiltration into and through the soil. In other words, permeability is reduced when waters containing high levels of sodium are used for irrigation. Relative permeability is often expressed as SAR (Sodium Adsorption Ratio), the ratio of sodium ion concentration to that of calcium plus magnesium.

Generally, a high water SAR ($SAR > 9$) can cause severe permeability problems when applied to fine textured (clay) soils over a period of time. In coarse textured (sandy) soils permeability problems are less severe and a SAR to this magnitude can be tolerated. Golf greens constructed on pure sand with good drainage, for example, can be maintained using high SAR irrigation waters.

In soil, sodium related impermeability problems are measured as ESP (Exchangeable Sodium Percentage). Sodic soils contain excess sodium ions relative to calcium and magnesium ions. Sodium does not usually cause direct injury to turfgrasses, which among landscape plants, are relatively sodium tolerant. Generally, however, if the ESP exceeds 15, a turf stand may be damaged by soil impermeability to water and air. Typical symptoms of reduced permeability include waterlogging, slow water infiltration, crusting and/or compaction, poor aeration, weed invasion, and disease infestation. All of these effects are detrimental to plant growth and development.

Reduced soil permeability can also occur when the salt content of irrigation water is very low (below 0.5 dS m^{-1}). Water and mineral salt content reduces permeability by dissolving calcium and other soluble particles, which disperse and fill soil pore space.

Salts and sodium do not act independently in the plant environment. It has been shown that the effects of sodium on soil particle dispersion (and therefore impermeability) are counteracted by high electrolyte (soluble salts) concentration; therefore the soil sodicity hazard cannot be assessed independently of salinity. The combined effect of salinity (electrical conductivity) and sodicity (SAR) on the degree of impermeability caused by a given water is shown in Figure 26. The table provides only general guidelines for interpretation of irrigation water quality. Soil properties, irrigation management, climatic conditions, plant salt tolerance, and cultural practices, all play major roles in the effects caused by irrigation water containing given levels of salt and sodium.

C3. Toxic Elements

Effluent waters usually contain a wide variety of elements in small concentrations. Problems can occur when certain elements accumulate in the soil to levels toxic to landscape plants. Toxicities can occur due to an accumulation of boron, chloride, or sodium. Boron concentrations of 2 ppm or higher may be toxic to many perennial landscape plants. Turfgrasses are usually much more tolerant of boron than other plants if they are mowed and the clippings are removed regularly.

Chloride is not particularly toxic to turf, but most trees and shrubs are quite sensitive to chloride content of 355 ppm or higher.

Milpitas generally has heavy-textured soils. Under normal conditions, somewhat slow infiltration rates of approximately 0.01-0.10 inches per hour would be expected. However in some regions such as areas west of I-880, soil structure has been compromised reducing drainage potential. This poses a special challenge, since in order to leach toxic levels of boron and soluble salts from the rooting area, soils must drain adequately. To address the structural problems associated with this type of soils, special soil reclamation processes or soil replacement may be required. This may include use of organic, chemical, and polymeric soil amendments. It should be noted that careful adherence to final grading, amending techniques, and pre/post-plant leaching irrigation is critical to the success of such an amendment strategy.

Irrigation systems must be capable of leaching soluble salts from the rooting systems of all ornamental plantings. Generally speaking, conventional spray irrigation systems are best suited for this purpose. Drip-emitter systems rarely provide uniform surface distribution to adequately leach salts and toxic ions from root zones, and are prone to clogging from the particulates in recycled water.

D. Plant Species Considerations

Based on a study¹⁹ of the composition of the recycled water source, generalized soil conditions, environmental conditions, and city maintenance standards, most plant species (hardy enough for streetscape plantings) will be adaptable to irrigation with recycled water as long as certain soil and water management requirements are met.

Ornamental trees, shrubs, and ground-cover plants do have varying tolerances to high salinity or toxic ions, which may be present in recycled water. Research on ornamental sensitivity to constituents found in recycled water is very limited. Most research has been conducted on agricultural crops.²⁰ The vast majority of plant-lists, showing sensitivity or tolerance to recycled water, is the result of field observations by various agencies and/or professionals. These lists should be used as a starting point in the plant selection process.

For the City of Milpitas, the South Bay Water Recycling Agency publishes a recognized plant list. Based on this information as well as field observations, these species have been included on the species characteristics tables (Figures 21 and 22).

E. Specific Recommendations When Using Recycled Water

1. Analyze existing soil conditions to determine appropriateness for use with recycled water. Based on the findings, condition and amend soils to adjust for physical and chemical imbalances.
2. Select plant species with similar water requirements²¹ and similar recycled water tolerance.
3. Design and install irrigation systems specifically for use with recycled water²².
4. Irrigate landscapes (using recycled water) in such a way to minimize accumulated salts in the root zones while meeting water needs of the plant materials²³.
5. Perform periodic landscape water audits²⁴ to maximize irrigation efficiency.²⁵

¹⁹ Recycled Water Guidelines project for the City of Milpitas, Sealana & Associates, 1999-2000

²⁰ Citation: Soil Salinity Laboratory, University of California, Riverside.

²¹ Use of W.U.C.O.L.S. (Water Use Classification of Landscape Plants), University of California guideline is recommended.

²² See also City of Milpitas Municipal Ordinance, Title VII Public Works Chapter 5 Water Efficient Landscapes, Recycled Water Guidelines project for the City of Milpitas, Sealana & Associates, 1999-2000, and South Bay Water Recycling Agency publications such as "Greener Landscapes with Recycled Water."

²³ Utilize the Landscape Coefficient Method, University of California.

²⁴ Utilize the Certified Landscape Water Auditor (CLIA) program, State of California, Department of Water Resources and the Irrigation Association

²⁵ Pursuant to City of Milpitas Water Conservation guidelines, audits are to be performed every five years

Figure 26 Water Quality Guidelines for Irrigation is an adaptation of the University of California, Leaflet 2995, *Water Quality Its Effects on Ornamental Plants*. It should be used as a general horticultural guideline when comparing salts and constituents contained in recycled water. The information provided above, combined with information from the South Bay Water Recycling Agency should be used to continuously monitor and manage landscapes being watered with recycled water.

VIII. Streetscape Maintenance

A. Pruning Standards

Standards for tree pruning are established by the industry and are embodied in two primary documents and industry organizations. The most recent is the American National Standards Institute (ANSI) who has established the ANSI A300 standard for Tree Care Operations – *Tree, Shrub and Other Woody Plant Maintenance – Standard Practices* (1995). This standard is established in connection with the second primary document, the *International Society of Arboriculture – Pruning Guidelines*.

A1. Degrees of Pruning

For municipal “production” pruning, four general degrees of pruning are often used to describe the intensity of pruning:

- a. Safety or coarse trimming is the removal of dead, dying, diseased or obviously weakened branches two or more inches in diameter, or less than two inches in diameter if the branch is a potential hazard.
- b. Medium pruning is the removal of dead, dying, diseased, interfering and weakened branches on the main trunk as well as those within the canopy leaf area. An occasional branch up to one inch in diameter may remain within the main leaf canopy area when it is impractical to remove it from a cost effectiveness standpoint. It is not worth climbing the tree to remove one minor, non-hazardous branch that is extending outside the general crown area.
- c. Fine pruning is the removal of dead, dying, diseased, interfering, obstructing and weak branches as well as selective thinning to lessen wind resistance. Such branches should be removed both on the main trunk and inside the leaf canopy area. An occasional branch up to one-half inch diameter may remain within the main leaf area to its full length when it is not practical to remove it. Fine pruning is not recommended as a standard practice for routine street tree maintenance except for shaping young trees because of the labor and equipment costs.

Type of Problem	Degree of Problem		
	Negligible Effects on Plant Growth	Increasing Effects on Plant Growth	Severe Effects on Plant Growth
Salinity:			
(A) Ecw (ds/m)	Less than 0.75	0.75-3.0	More than 3.0
(B) TDS (mg/l)	Less than 480	480-1920	More than 1920
Permeability:			
(A) Low Ecw (ds/m)	More than 0.5	0.5-0	>
(B) Low (mg/L)	More than 320	320-0	>
(C) SAR	Less than 6.0	6.0-9.0	More than 9.0
Toxicity of ions to sensitive crops through root absorption:			
(A) Sodium (evaluated by SAR)	Less than 3.0	3-9 ²⁶	More than 9
(B) Chloride (meq/L)	Less than 2.0	2-10	More than 10
(mg/L)	Less than 70	70-345	More than 245
(C) Boron (mg/L)	1.0	1.0-2.0	2.0-10.0
Foliar absorption:			
(A) Sodium (meq/L)	Less than 3.0	More than 3.0	>
(mg/L)	Less than 70	More than 70	>
(B) Chloride (meq/L)	Less than 3.0	More than 3.0	>
(mg/L)	Less than 100	More than 100	>
Unsightly foliar deposits:			
(A) Bicarbonate (meq/L)	Less than 1.5	1.5-8.5	More than 8.5
(mg/L)	Less than 40	40-520	More than 520
pH	6.5-8.3	More than 8.3	>

Interpretation is related to the type of problem and its severity, but modified by circumstances of soil, crop, and local experience.

> Severity of problem varies with plant species and environmental conditions.

Figure 26. Water Quality Guidelines for Irrigation²⁷

²⁶ This SAR value has never been specifically identified for ornamental crops, but was observed on agricultural crops grown in clay or clay-loam soils.

²⁷ Adapted from the Cooperative Extension, University of California, Leaflet 2995, Water Quality Its Effects on Ornamental Plants. Prepared by Richard K. Sealana Sr., Sealana & Associates

- d. Cutting back by drop crotch pruning is the size reduction of tops, sides, underbranches or individual limbs by pruning back to a strong later crotch. This is the recommended practice for utility line interference and where portions of the top must be removed to compensate for the root system being severed by sewer, water or sidewalk construction, or when there is unusual and rapid tree growth. Such drastic pruning is also sometimes necessary after a severe windstorm when large branches or major portions of the tree are severely damaged and potentially endanger human life and property. Branches are cut back to a crotch with a side branch not less than one third the diameter of the branch being removed. Wounds made by splitting limbs should be cleaned of torn and broken wood fibers and bark traced to ensure proper healing. Unaffected branches should be headed back to balance cuts made on broken branches particularly to reduce exposure to future high winds. When such severe pruning must be done, the immediate effect may appear undesirable but carefully planned pruning within a few years can help fill the gaps and develop a well-shaped tree.

A2. Basic Pruning Techniques

The City of Milpitas pruning specifications for use by outside contractors (or city Staff), should include:

- a. All cuts should be made sufficiently close to the trunk or parent limb without cutting into the branch collar or leaving a protruding stub. This encourages proper closing of the wound within a minimum time.
- b. Limbs and branches larger than six inches in diameter should be lowered using ropes or other mechanical devices to prevent damage to personnel and property.
- c. The weaker or least desirable of crossed or rubbing branches should be removed if it does not leave a large hole in the general outline of the tree.
- d. Old pruning injuries that are not closing properly should be bark traced where necessary to assist future callous development without disturbing existing callous or decay compartmentalization.
- e. Young trees should be shaped early to promote sound structural growth and attractive functional growth habit.
- f. Trees with an excurrent growth form such as *Liquidamber* sweetgum and *Liriodendron* tulip tree should be pruned to a strong central leader in a manner that promotes the development of strong scaffold limbs. Trees with decurrent growth such as ash, should be pruned to eliminate V-crotching and encourage U-shaped crotches.

A3. Unacceptable Trimming Practices for Trees

- a. Pollarding or heading back is when a tree is severely pruned back to consist of one main trunk and a number of short lateral branch stubs. This type of pruning results in excessive sucker growth the next season. These new branches are often weak and never develop into healthy laterals because they develop from adventitious buds and there is no firm connection with the main wood frame of the tree. Trimming procedures that cut back to three inch (or larger) stubs weaken the structure of the tree as well as deter from the beauty of the natural form of the tree.
- b. Framing is a pruning technique that removes many of the inside branches and results in clusters of small branches at the end of main branches. This picturesque landscaping pruning technique is not recommended for street trees because it is extremely time consuming and very costly. Additionally, in high wind areas trees are predisposed to limb breakage.
- c. Roundovers or shearing is when branches are trimmed to present a sheared appearance over the total surface of the crown or just on top. This type of pruning places cuts anywhere along a branch (not necessarily at the base of the limb) and results in severe suckering. As in pollarding, these suckers have a weak structural attachment. (Exceptions to this recommendation are *Ficus nitida* and other small ornamentals that are sometimes sheared to specific shapes and are adapted to this form of pruning.)

B. Tree-Related Liability & Risk Management – Development of an Inspection Program

In the state of California, the basic principles governing the liability of a public entity for damage caused by trees are contained in the government code that has been elaborated by various judicial opinions. The thrust of the code and judicial opinions is that a public entity is liable for a dangerous condition of public property if the danger is obvious enough that the public entity knew or should have known of the danger within a reasonable period of time beforehand so that it could have taken steps to remove the danger, and then failed to act in a timely manner to eliminate the hazard. Some sort of reasonable due diligence inspection system to spot dangerous conditions is implied by the expression "should have known of the danger". With some notable exceptions the public entity is charged with the responsibility of spotting potentially dangerous conditions in advance of an accident. For instance, it is not sufficient to rely upon the defense that our city did not actually know that this tree limb was rotten and about to fall upon the roadway. If the condition of the limb was reasonably obvious for some length of time, it was the responsibility of the entity to have a sufficient inspection system to uncover problems of this nature so that steps could be taken to avoid accidents.

Applying these principals to particular tree situations, it is quite clear that in the case of a tree which the city or county has the duty to maintain, that if the tree should bear branches which have died, split or are otherwise weakened so that there is a danger that they will fall upon persons, automobiles or other property, the entity involved may be liable for the damage caused if the condition was such that it was actually known to the entity, or if the condition could have been discovered by a reasonable inspection system. The foregoing applies to entire trees which may fall because of damage, disease or because they have died.

Public entities may be held to be on notice that winds occur, and that certain types of trees should be kept pruned back to reduce their wind vulnerability, but there are still acts of God. An occurrence as rare as a tornado in certain areas of the country would probably be considered an act of God for which no one is to be held responsible. Nevertheless, it would not be wise to rely upon an act of God concept to seek exoneration from a situation where a large tree is old enough and weak enough so that anyone, who is at all informed, knows that the tree is likely to fall whenever there is a windstorm of expectable strength for the area.

Another problem arises where trees are planted close to a street or highway where their branches may overhang the street at a height that campers, trucks and other relatively tall vehicles may strike the branch causing damage to the vehicle, or in some cases more serious accidents. If the tree involved is owned by the public entity, or if the public entity has the duty to maintain the tree, there is probable public liability for the damage if the height of the branch is unreasonably low. It is not uncommon for municipalities to have ordinances that assert control over the care and maintenance of street trees and which express minimum heights for branches over a public street. If the maintenance crews in charge of these trees allow low-hanging branches to remain, the public entity will probably be held responsible, and if the height is lower than the height mandated by an ordinance, the public entity would undoubtedly be held responsible.

It would be difficult to defend a case based upon low-hanging branches in the public right of way when the city has taken upon itself the maintenance duties. Most courts would find that, as a corollary to the maintenance duty, there is some duty to have an inspection system that discovers such low-hanging branches.

Trees which present a danger of falling, shedding large limbs, obstructing the view of traffic controls, or obstructing the taller vehicles which may legally be on the streets in question, must be pruned or removed. In the case of trees located upon private property, the state law enables a public entity to enact ordinances permitting public removal.

City of Milpitas Streetscape Master Plan

Another important facet to a control program is careful selection of the species to be planted. This facet comes into play in cases of new plantings and in replacement of dangerous trees. In addition to considering the aesthetic value of a given species of tree, one should carefully consider such things as wind vulnerability, tendency to produce heavy limbs that are vulnerable to falling, and the adequacy of the root system in terms of support.

Careful location of trees is equally important. Trees which have a tendency to produce low-hanging limbs should not be located immediately adjacent to streets unless the public entity is willing to undertake the expense and trouble of a vigorous pruning program to remove low-hanging limbs. Trees should not be located too close to intersections because they may obscure traffic controls.

The problem of tree roots clogging or disrupting private sewer lines presents entirely different considerations, unlike a specific injury to persons or property by a specific event such as a tree falling or a trip and fall on a badly cracked sidewalk. In the later case, an inspection system would reveal dangerous situations as the potential problems are at least visible. The essential invisibility of tree root systems and the tendency of sewer lines to develop cracks or openings in their joints because of the deterioration which accompanies age, earthquakes, ground settling and other natural forces materially alter public responsibility. Nevertheless, when an owner of residential property discovers that some of the roots of the tree that the public planted in the parkway fifteen or twenty years ago have entered his sewer line and have clogged it, the public entity which planted the tree is at the very least faced with an irate citizen and a potentially explosive situation. Use of bio-barriers²⁸ at pipe joints have been found to help deter roots from entering sewer lines. However, their long-term effectiveness is not known, so a program of monitoring and potential future root pruning or replacement of the bio-barrier is recommended.

C. Responsibility for Concrete Damage

Enabling legislation originates from Chapter 22 of Division 7, Part 3 of the California Streets and Highway Code. These provisions clearly place the responsibility for curb, gutter, and sidewalk maintenance on the abutting property owner.

Section 5610 of the California Streets and Highways Code places upon the owners of abutting property the duty to maintain the park strip or parking strip in such condition that the sidewalk will not endanger persons or property and maintain it in a condition which will not interfere with the public convenience. Equally clear, however, was a long line of court cases, which provide

²⁸ Bio-barriers are a product type developed in the last ten years that inbeds a slow release herbicide in a fabric or plastic barrier to deter root growth.

that the purpose of this section is to allocate maintenance costs between the municipality and the abutting property owner, and does not create a duty running in favor of third parties that might be injured. The duty, of course, exists if trees on the abutting property owner's private property were the proximate cause of the injury.

Consistent with this line of cases, the Sixth District Court of Appeals in December of 1989 decided the case of Williams vs. Foster in which, consistent with precedent, it was held that "We are unwilling to find the duty to maintain the sidewalk established by Section 5610 is owed to members of the public in the absence of clear and unambiguous legislative language, especially in light of the long standing judicial determination that abutters ordinarily have no such duty." However true, the courts decision in the Williams vs. Foster case invited cities to place such a duty upon the abutting property owner when it said, "The city could have enacted an ordinance which expressly made abutting owners liable to members of the public for failure to maintain the sidewalk or park strip, but it did not." This invitation was somewhat tempered by a footnote in which the court said "We are willing to assume, for purposes of this appeal, that such municipal ordinance would be valid."

As a result of these proceedings, cities are revising their municipal codes to clarify those provisions embodied in the Streets and Highway's Code. However in Milpitas, the city budgets \$125,000 to \$150,000 annually for sidewalk repair. The city also has a higher standard for repairing and replacing sidewalks than many of the surrounding municipalities. Details of this repair standard and guidelines for minimizing future damage are discussed in under Minimizing Concrete Infrastructure Damage in Section V. of this Appendix.

APPENDIX II

Standard Details

Standard Details

Planting details

- P-1 Tree Planting in Sidewalk
- P-2 Tree Planting in Median or Planting Area
- P-3 Soundwall Vine Planting
- P-4 Treewell Detail
- P-5 Root Barrier
- P-6 Tree Staking

Site Furniture and Utilities Coordination

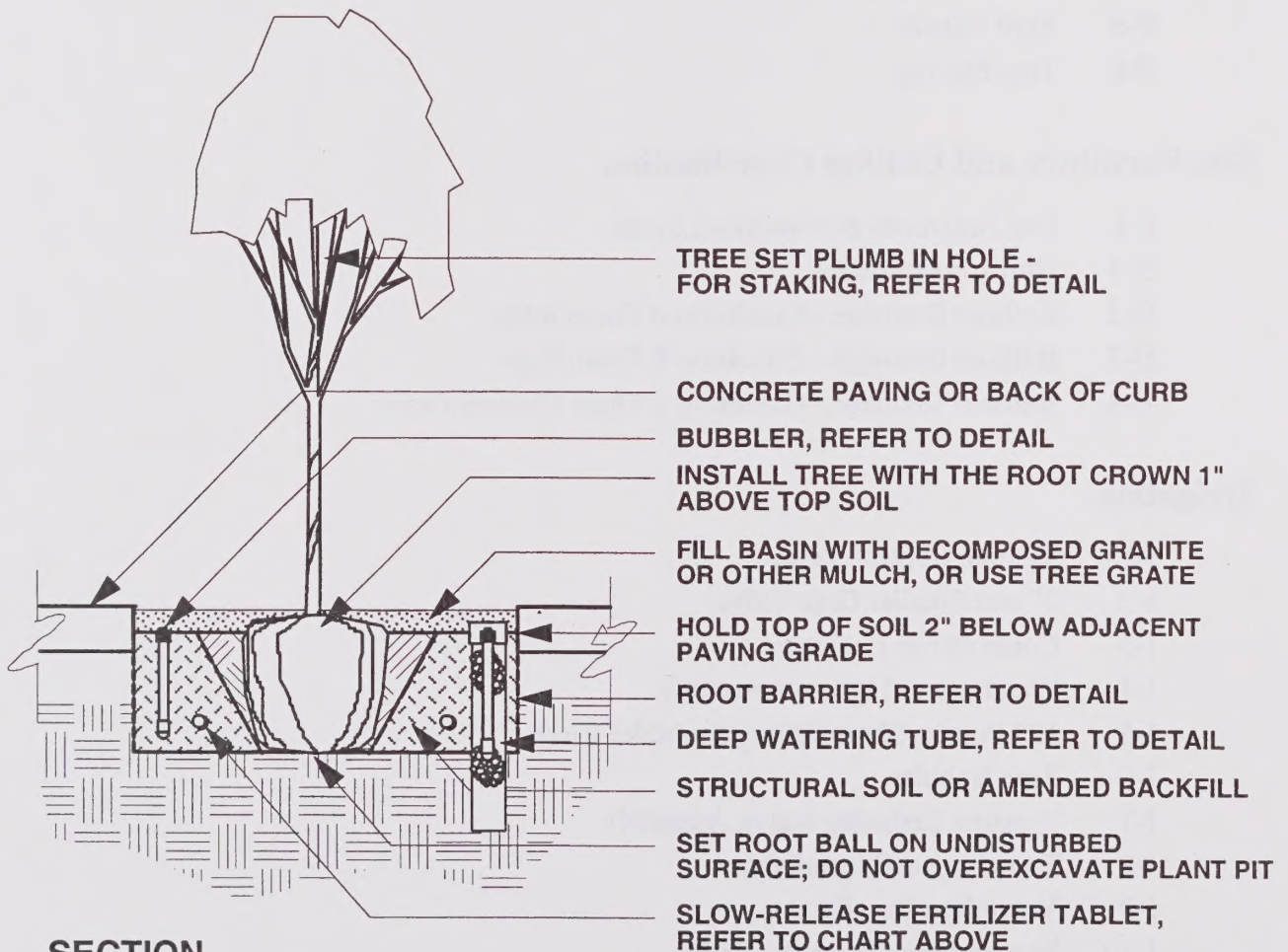
- F-1 Site Amenities & Furniture Layout
- U-1 Utility coordination
- U-2 Bulbout Drainage - Condition A Drain Inlets
- U-3 Bulbout Drainage - Condition B Drain Pipe
- U-4 Bulbout Drainage - Condition C Open Channel Drain

Irrigation

- I-1 Remote Control Valve
- I-2 3" and Smaller Gate Valve
- I-3 Controller in Enclosure
- I-4 Weatherproof Splice Assembly
- I-5 12" Pop-up Shrub Rotary Sprinkler Riser
- I-6 Tree Bubbler
- I-7 Pressure Reducing Valve Assembly
- I-8 Trenching and Installation
- I-9 Valve Box Installation
- I-10 Pop-up Spray Sprinkler Riser
- I-11 Potable/ Non-Potable Water Line Crossing
- I-12 Master Control Valve
- I-13 Flow Sensor
- I-14 Reduced Pressure Backflow Assembly
- I-15 Backflow Preventer Enclosure
- I-16 Backflow Preventer Enclosure

FERTILIZER TABLET CHART:

TREE SIZE OR CALIPER	NUMBER OF FERTILIZER TABLETS (SPACED EVENLY AROUND TREE)
5 GALLON	2
15 GALLON	2
24" BOX, 2" CALIPER	4
30" BOX, 2 1/2" CALIPER	4
36" BOX, 3" CALIPER	6
48" BOX, 4" CALIPER	6
60" BOX, 5" CALIPER	8



SECTION

NOTES:

1. TREES SHALL NOT BE ROOT-BOUND. CAREFULLY SCARIFY ROOTBALL BEFORE PLANTING.
2. REMOVE ANY SHOOTS WITHIN 6" OF SOIL.
3. CONFIRM POSITIVE DRAINAGE OF PLANT PIT PRIOR TO PLANTING TREE. INSTALL DRAIN AS PER TREETWELL DETAIL P-4. DRAINAGE RATE OF ALL MATERIALS, INCLUDING DECOMPOSED GRANITE OR OTHER MULCH, SHOULD BE NO LESS THAN 1/4" PER HOUR AND NOT EXCEED 2" PER HOUR.

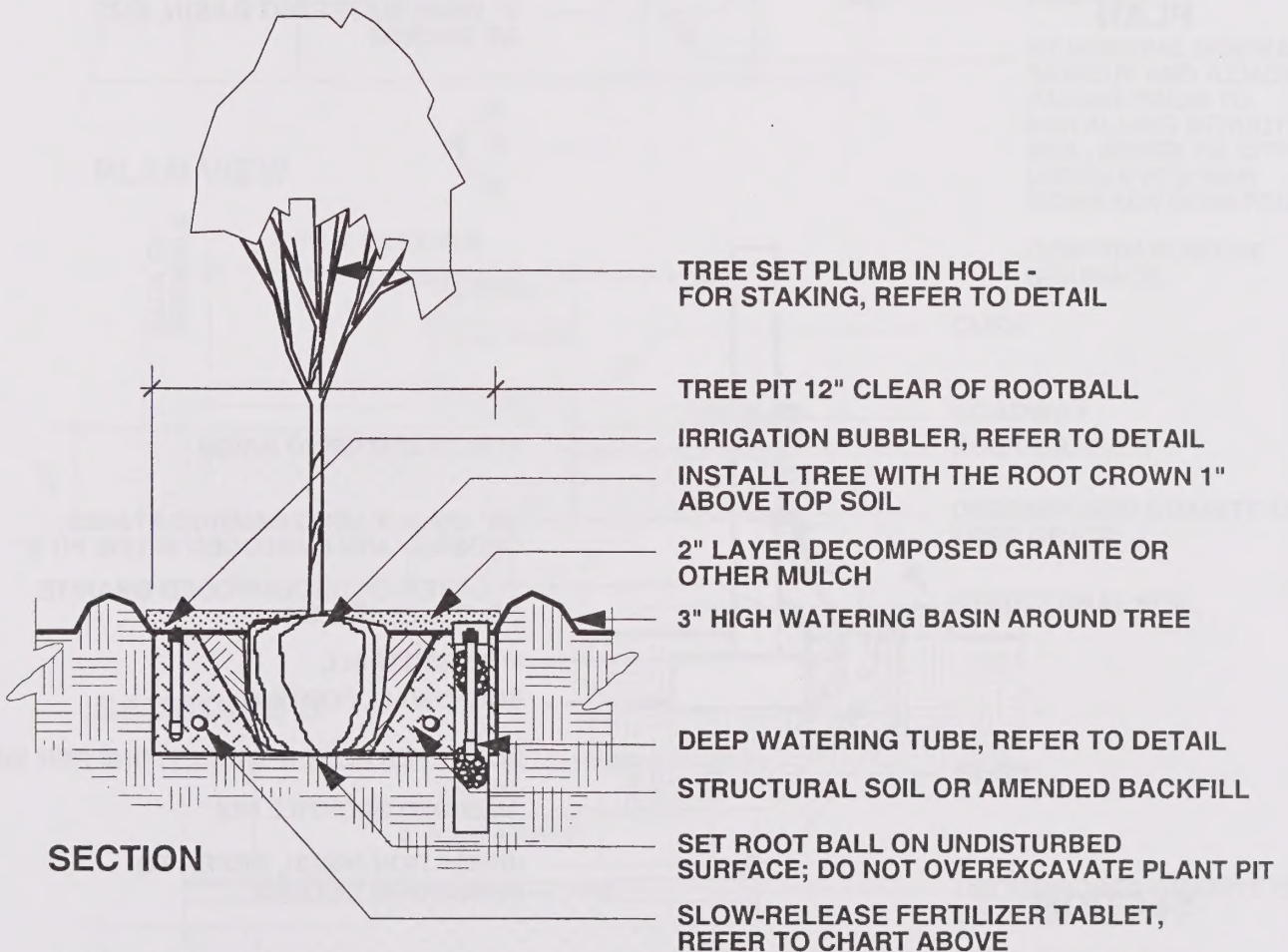
P-1

TREE PLANTING IN SIDEWALK

SCALE: 3/8" = 1'-0"

FERTILIZER TABLET CHART:

TREE SIZE OR CALIPER	NUMBER OF FERTILIZER TABLETS (SPACED EVENLY AROUND TREE)
5 GALLON	2
15 GALLON	2
24" BOX, 2" CALIPER	4
30" BOX, 2 1/2" CALIPER	4
36" BOX, 3" CALIPER	6
48" BOX, 4" CALIPER	6
60" BOX, 5" CALIPER	8



NOTES:

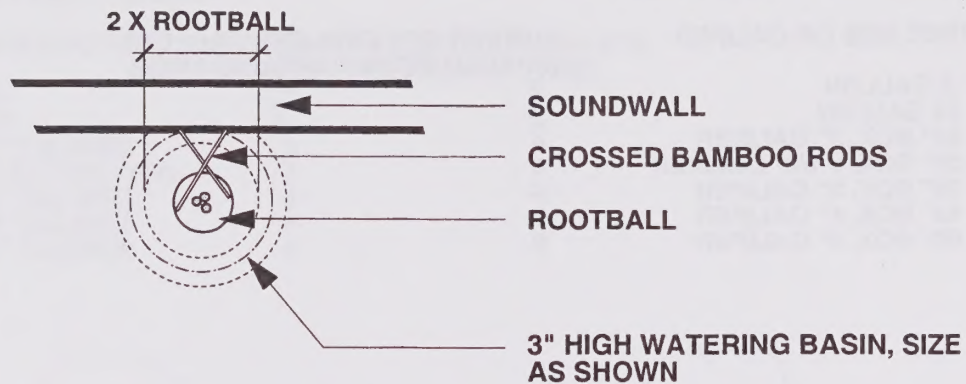
1. TREES SHALL NOT BE ROOT-BOUND. CAREFULLY SCARIFY ROOTBALL BEFORE PLANTING.
2. REMOVE ANY SHOOTS WITHIN 6" OF SOIL.
3. IF TREE TRUNK IS WITHIN SIX FEET OF PAVING OR CURB INSTALL ROOT BARRIER, REFER TO DETAIL.
4. CONFIRM POSITIVE DRAINAGE OF PLANT PIT PRIOR TO PLANTING TREE. INSTALL DRAIN AS PER TREEWELL DETAIL P-4. DRAINAGE RATE OF ALL MATERIALS, INCLUDING DECOMPOSED GRANITE OR OTHER MULCH, SHOULD BE NO LESS THAN 1/4" PER HOUR AND NOT EXCEED 2" PER HOUR.

P-2

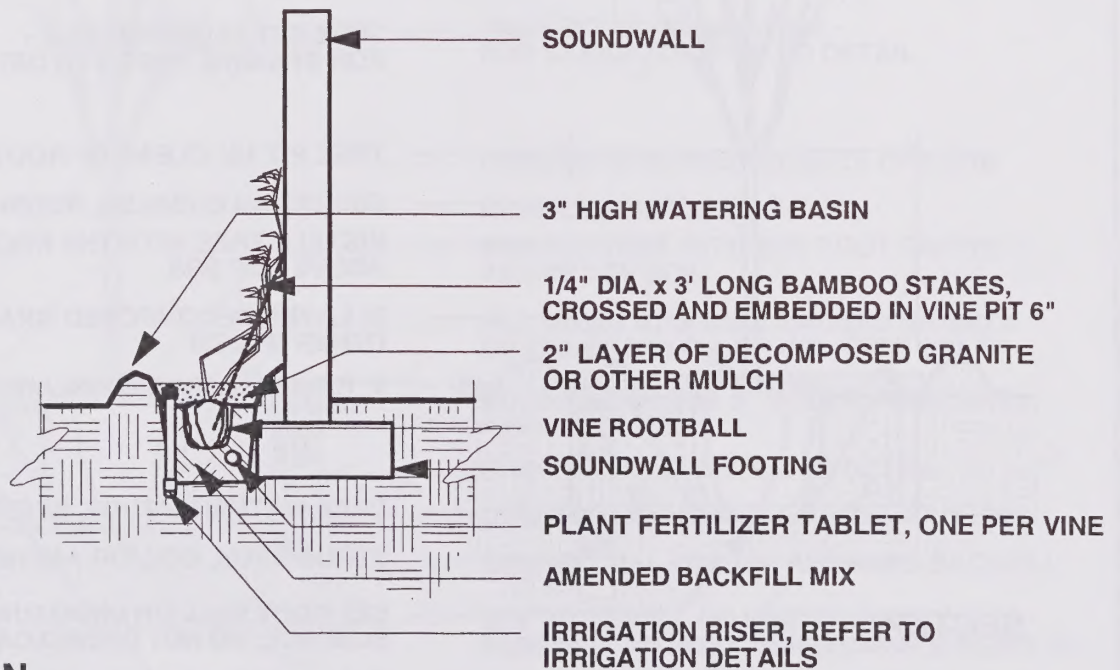
TREE PLANTING IN MEDIAN OR PLANTING AREA

SCALE: 3/8" = 1'-0"

PLAN



SECTION



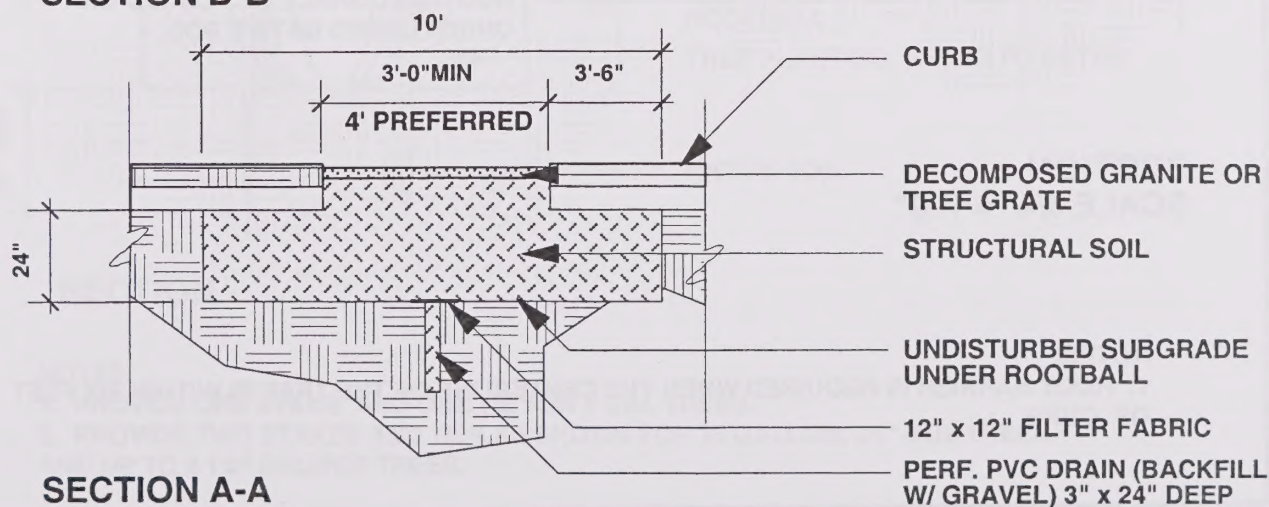
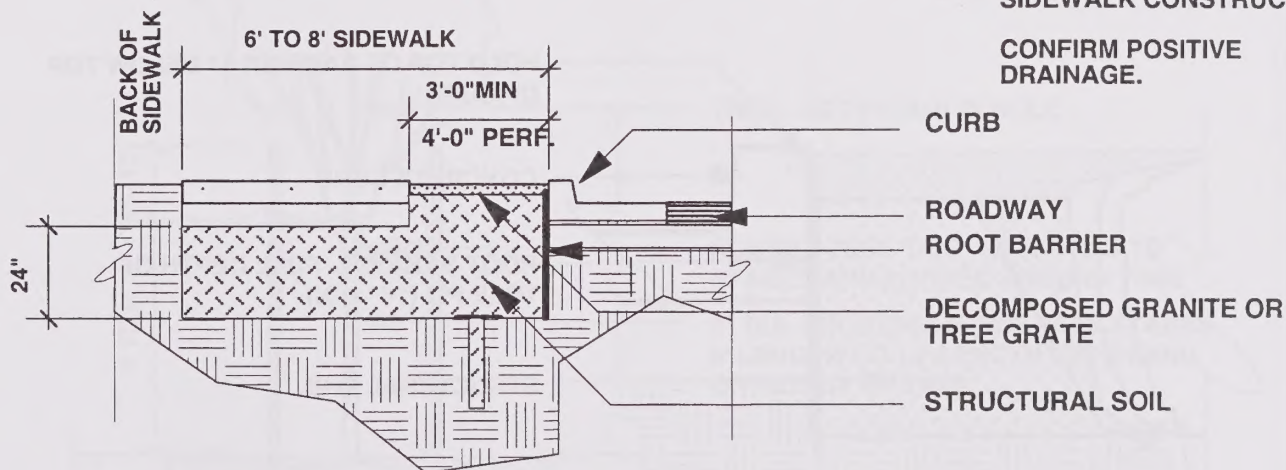
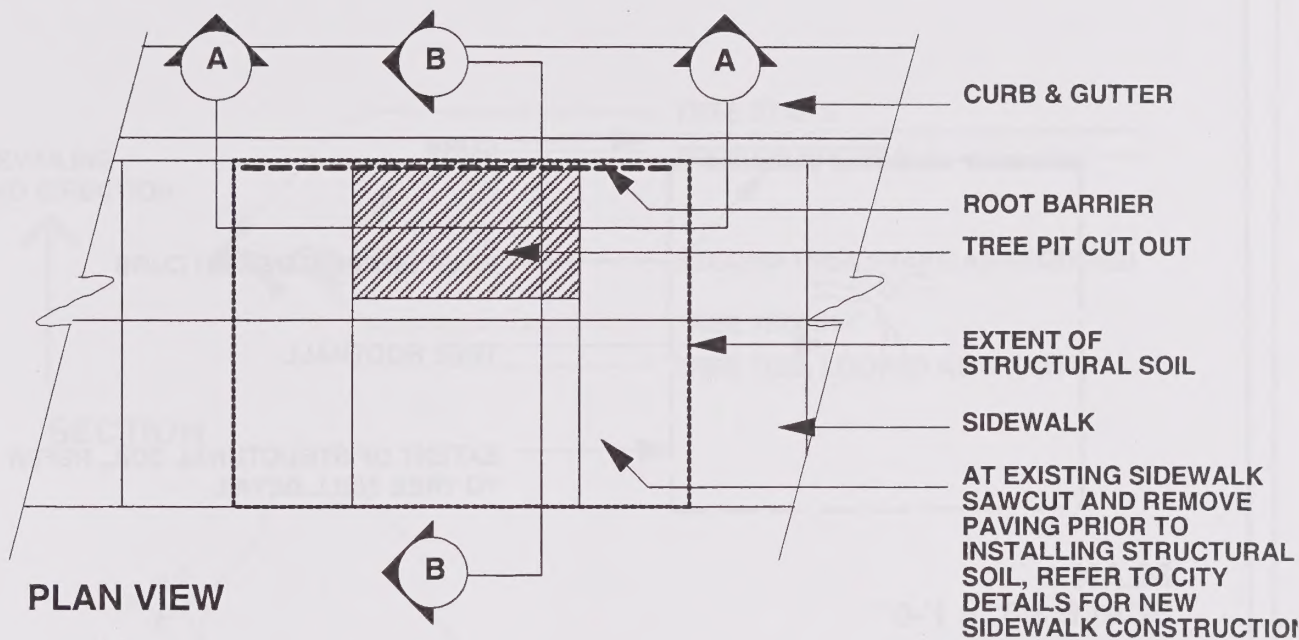
NOTES:

1. CONFIRM POSITIVE DRAINAGE OF PLANT PIT PRIOR TO PLANTING. INSTALL DRAIN AS PER TREEWELL DETAIL P-4. DRAINAGE RATE OF ALL MATERIALS, INCLUDING DECOMPOSED GRANITE OR OTHER MULCH, SHOULD BE NO LESS THAN 1/4" PER HOUR AND NOT EXCEED 2" PER HOUR.

P-3

SOUND WALL VINE PLANTING

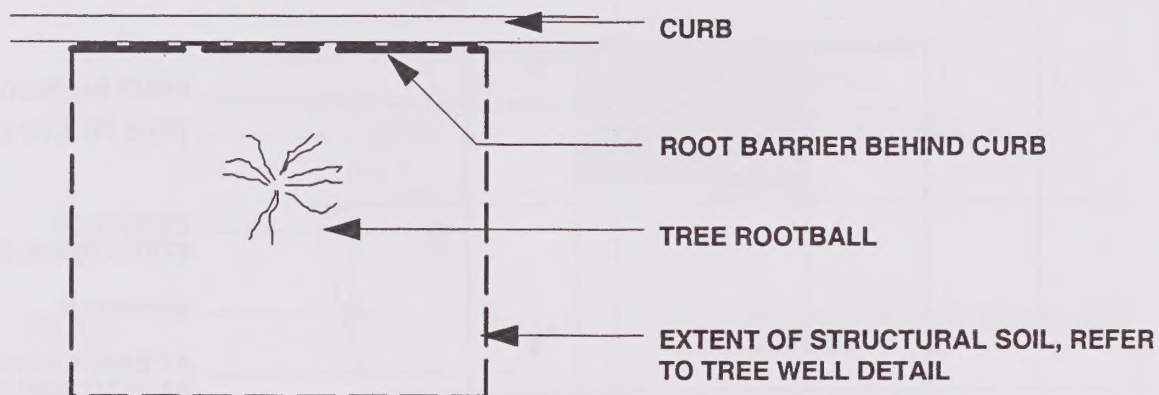
SCALE: 3/8" = 1'-0"



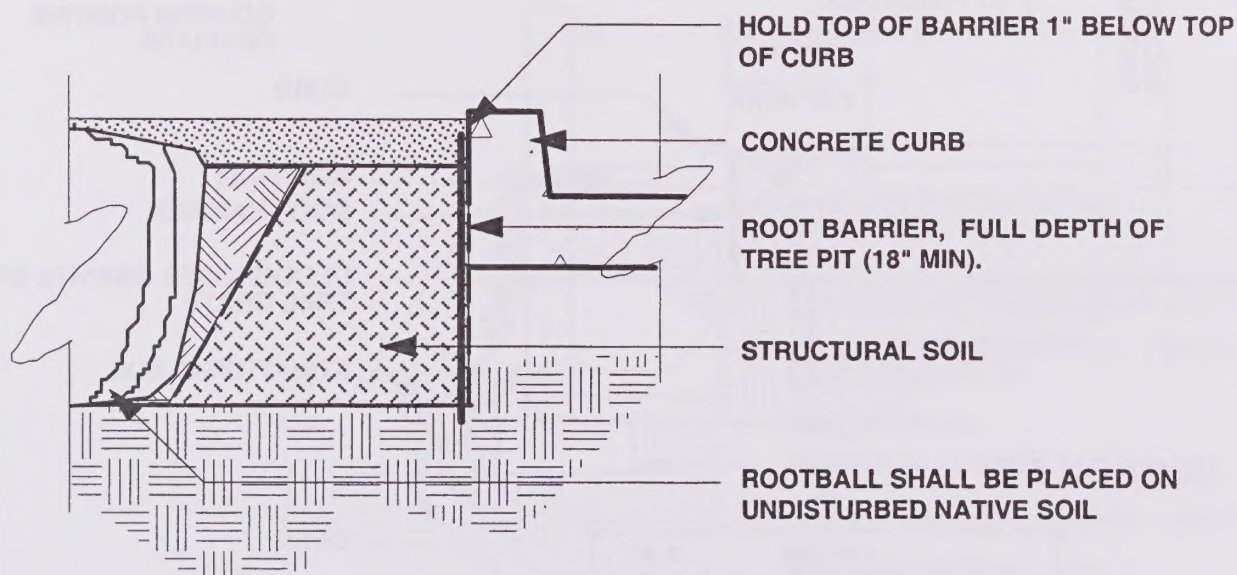
P-4

TREEWELL DETAIL

SCALE 1/4" = 1'-0"



PLAN
SCALE 3/8" = 1'-0"



SECTION
SCALE 3/4" = 1'-0"

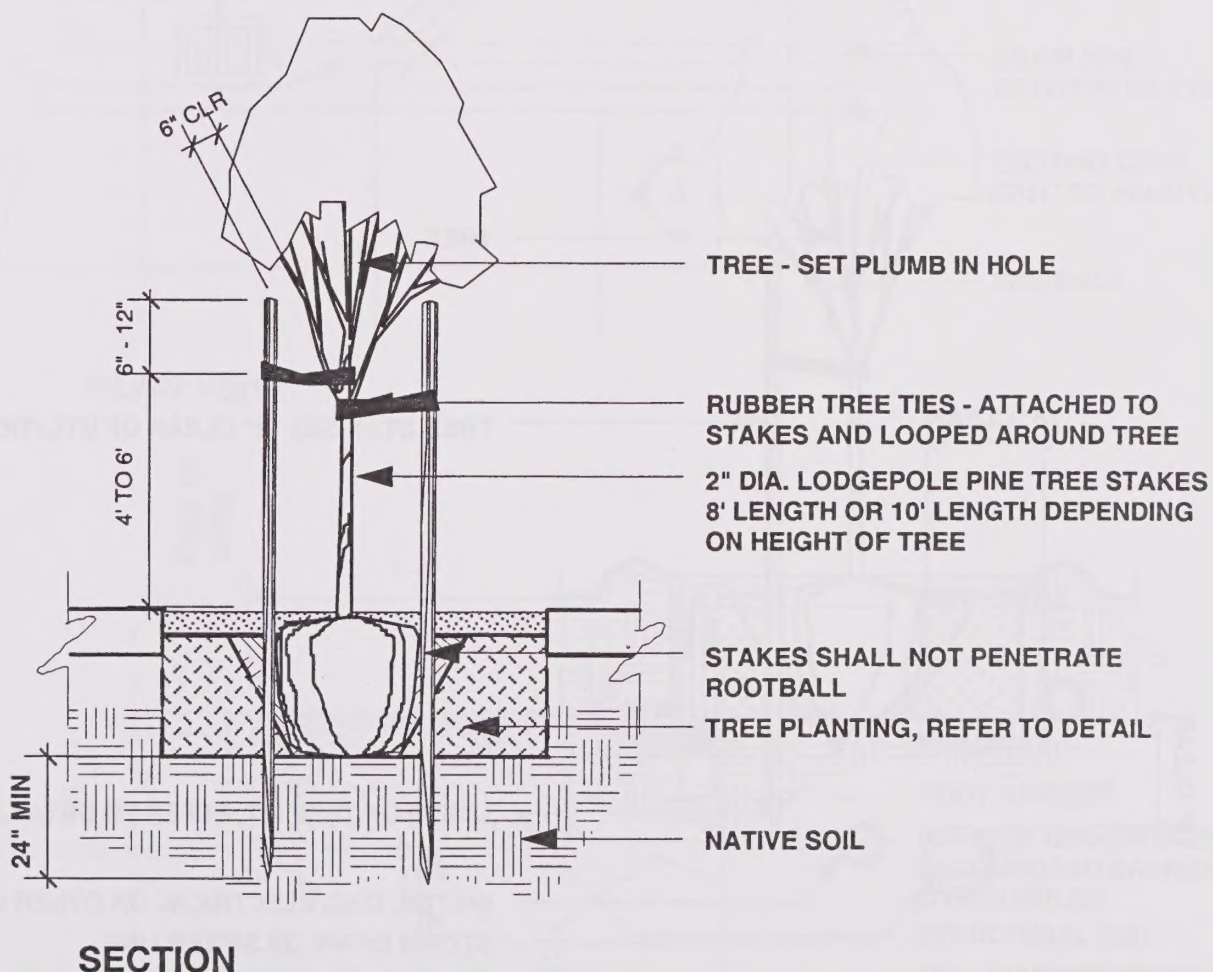
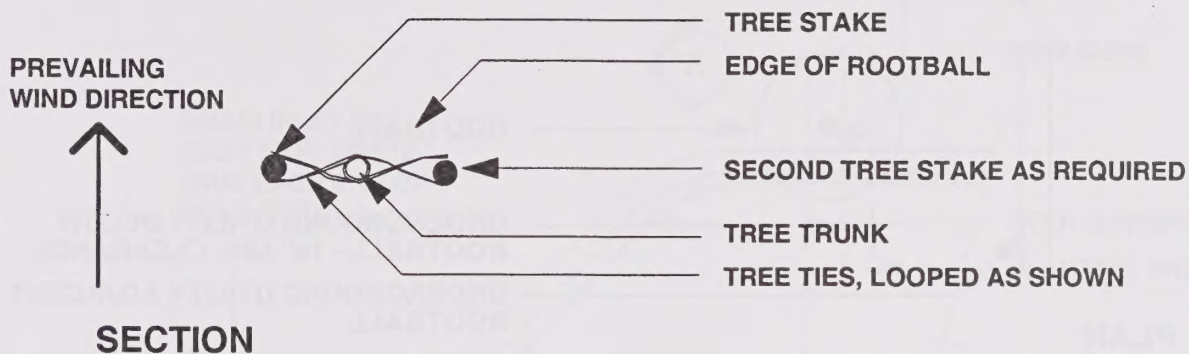
NOTES:

1. ROOT BARRIER IS REQUIRED WHEN THE CENTERLINE OF THE TREE IS WITHIN SIX FEET OF CURB.

P-5

ROOT BARRIER

SCALE: AS SHOWN



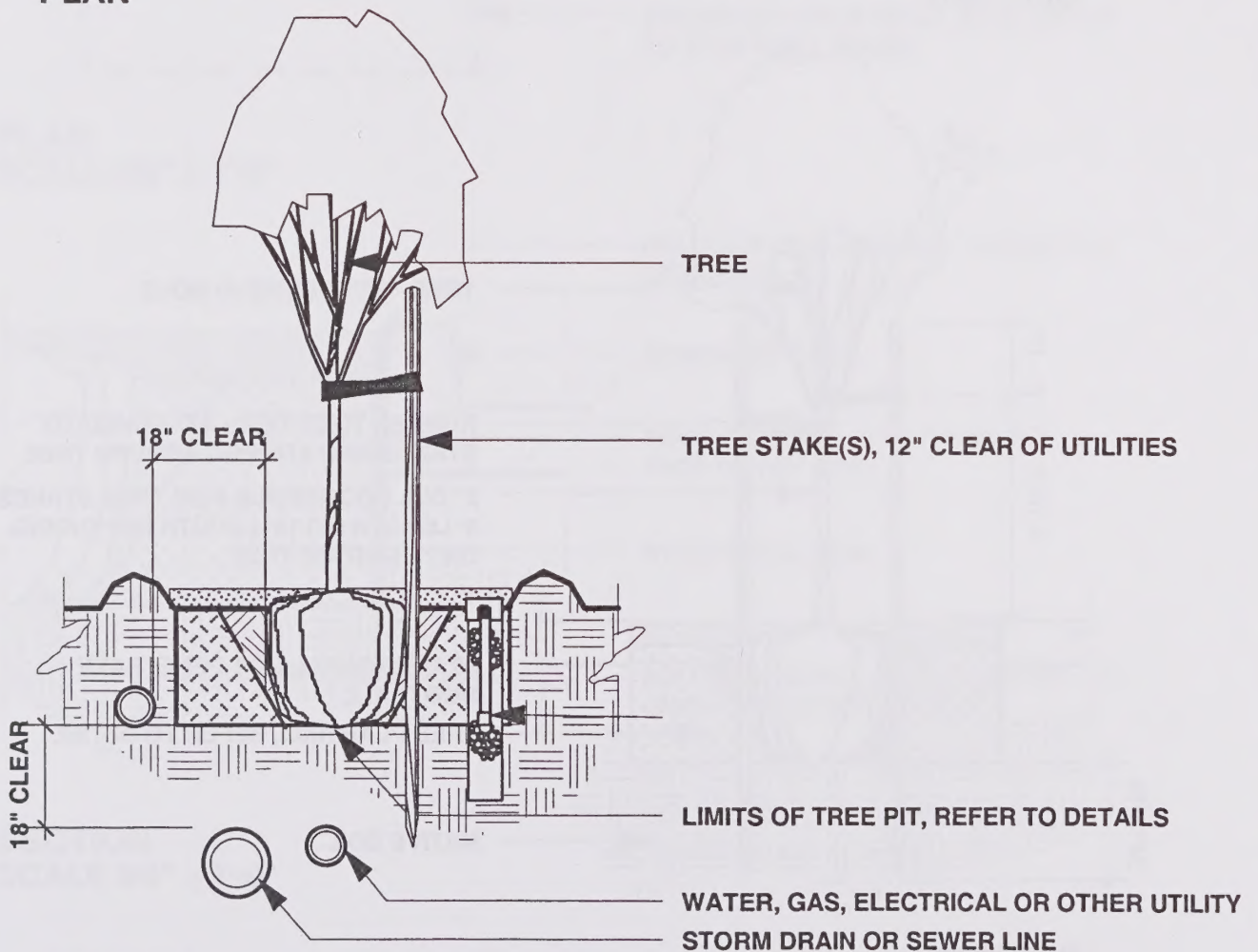
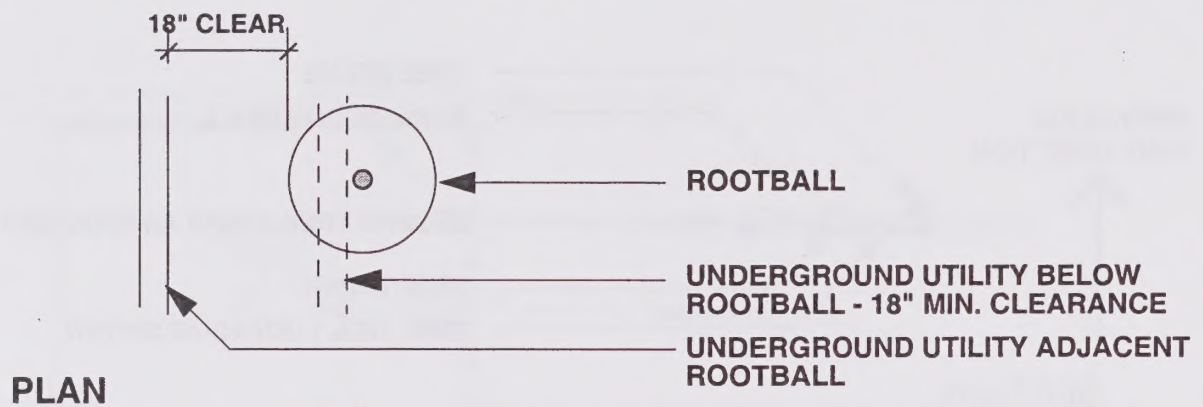
NOTES:

1. PROVIDE ONE STAKE AND ONE TIE FOR 5 GAL TREES.
2. PROVIDE TWO STAKES AND TIES AS SHOWN FOR 15 GALLON, 24" BOX TREES AND UP TO 2 1/2" CALIPER TREES.

P-6

TREE STAKING DETAIL

SCALE: 3/8" = 1'-0"



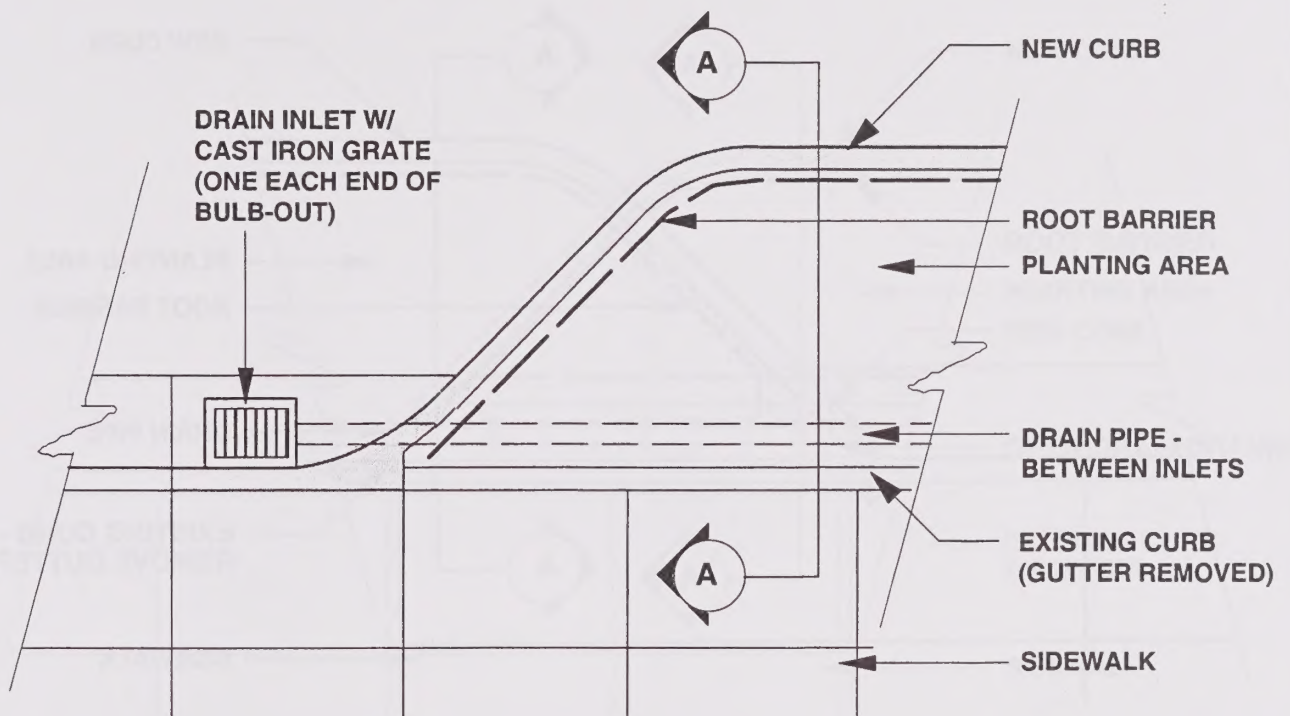
NOTES:

1. BEFORE EXCAVATING FOR TREE CONTACT USA SERVICE ALERT @ 1 (800)____-____ SO THAT UNDERGROUND UTILITES CAN BE MARKED.

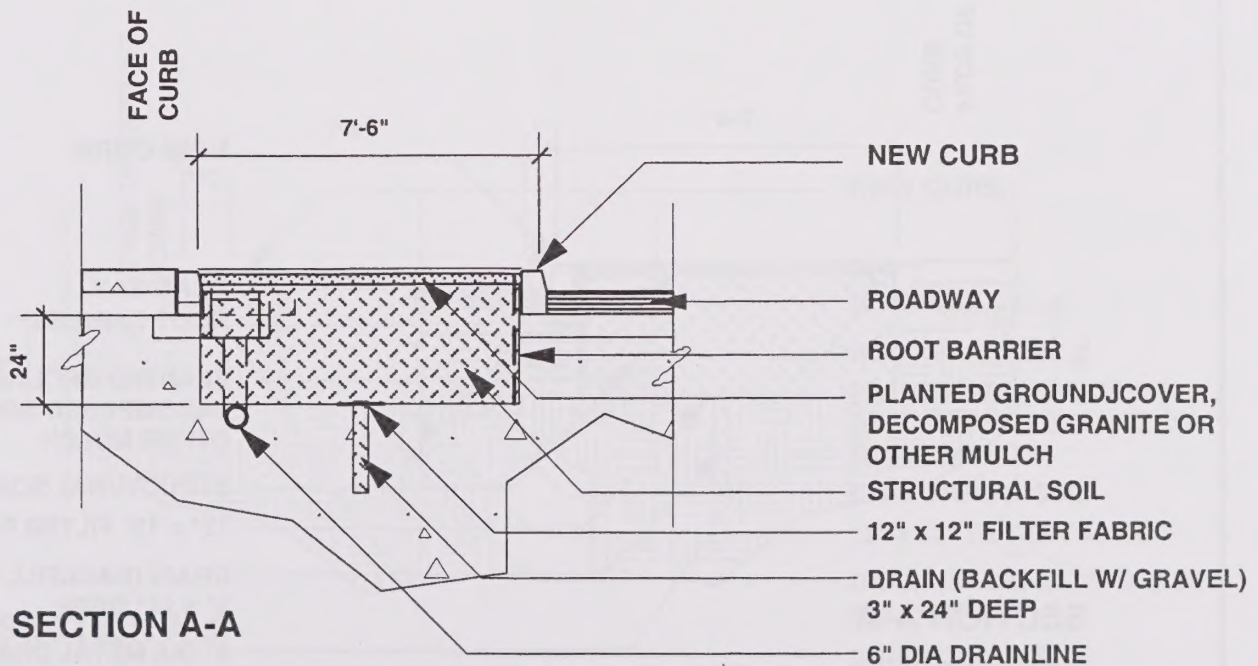


UTILITY COORDINATION

SCALE: 3/8" = 1'-0"



PLAN VIEW

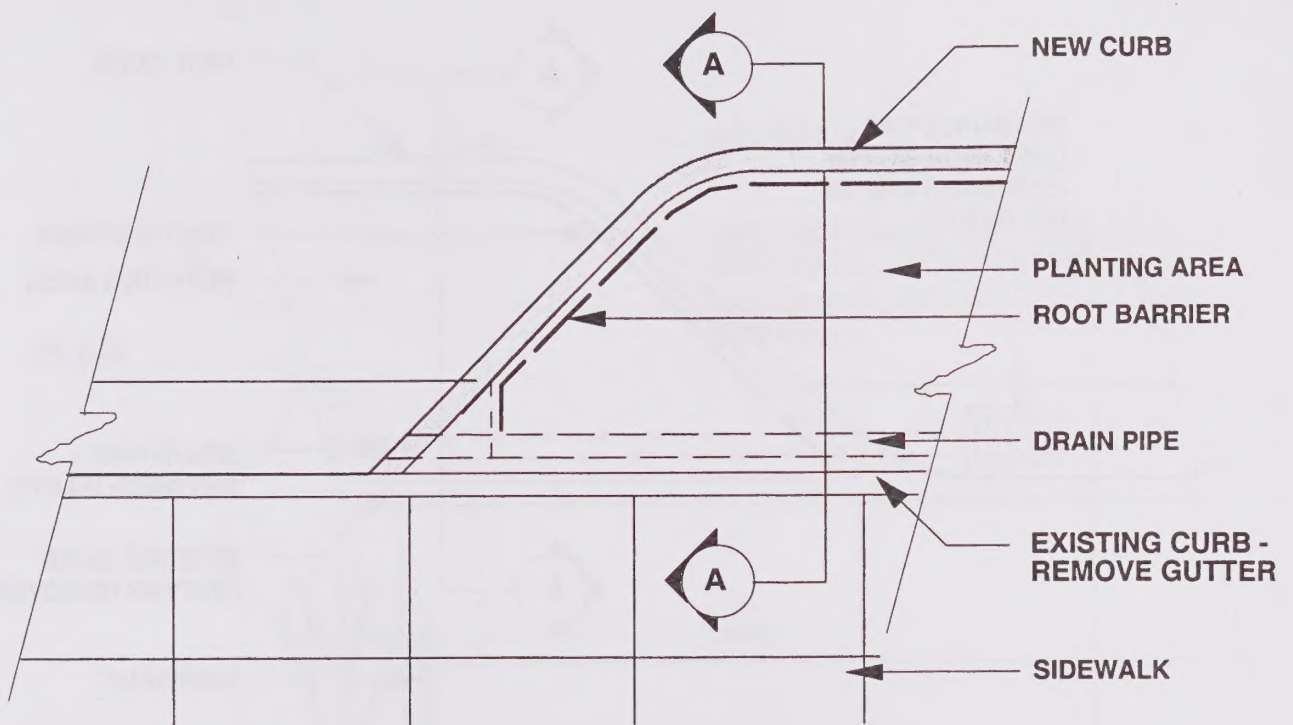


SECTION A-A

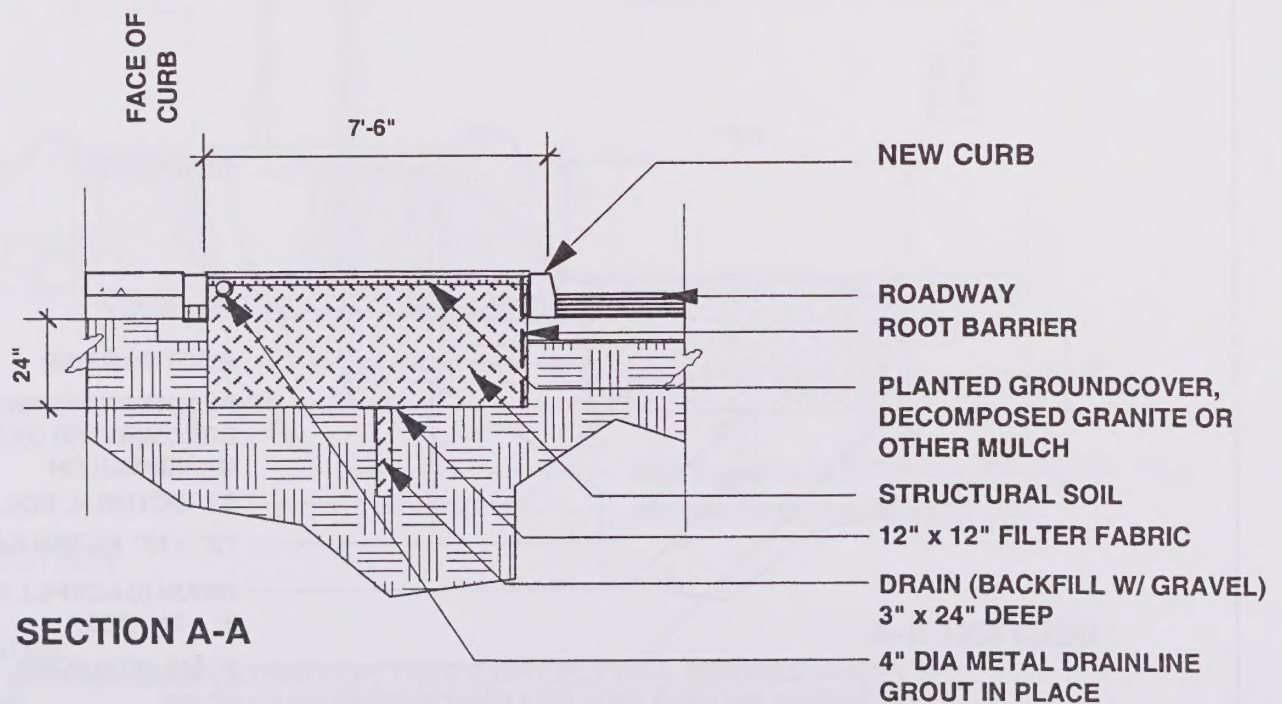
U-2

BULB - OUT CONDITION A

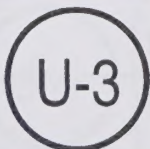
SCALE 1/4" = 1'-0"



PLAN VIEW

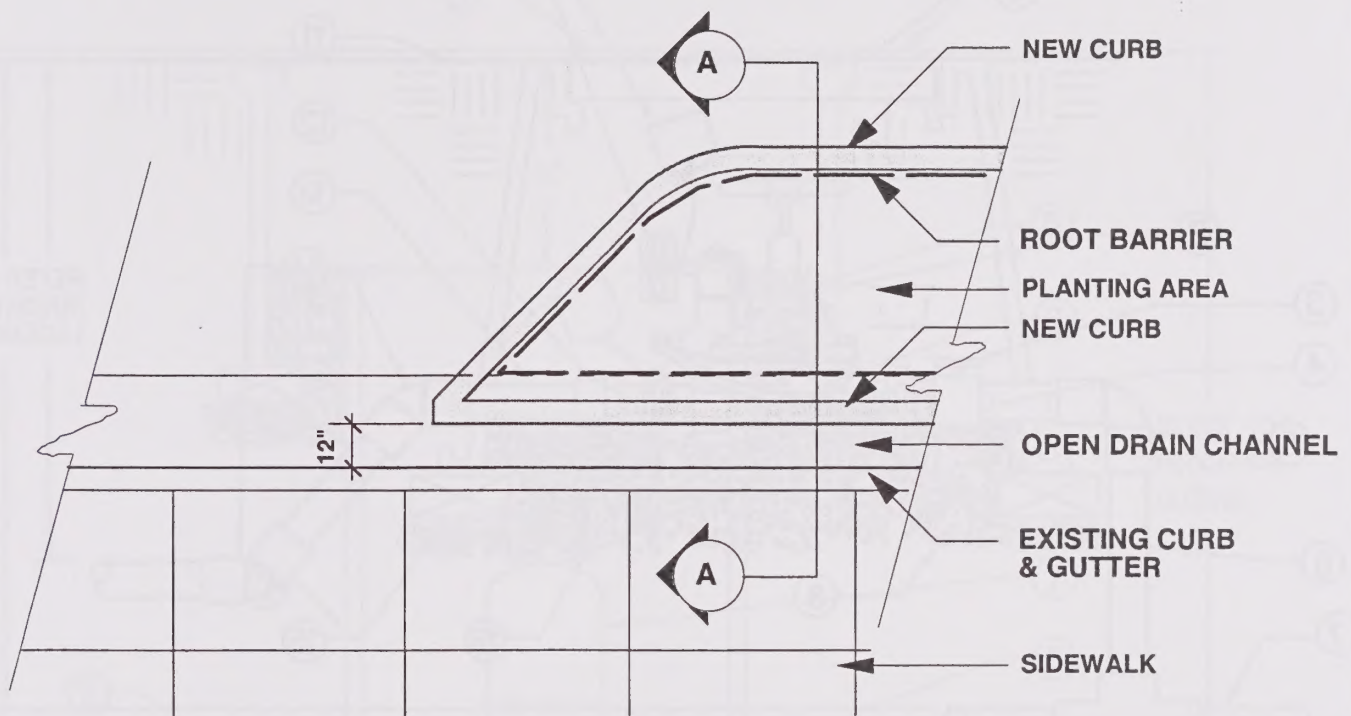


SECTION A-A

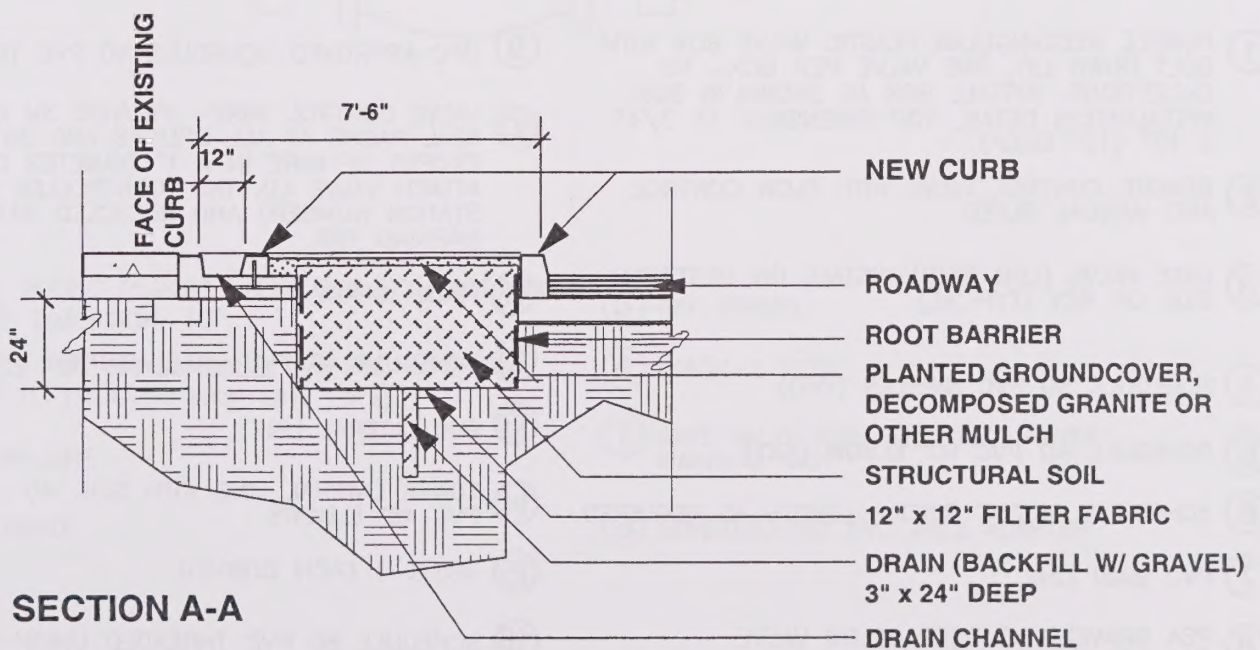


BULB - OUT CONDITION B

SCALE 1/4" = 1'-0"



PLAN VIEW

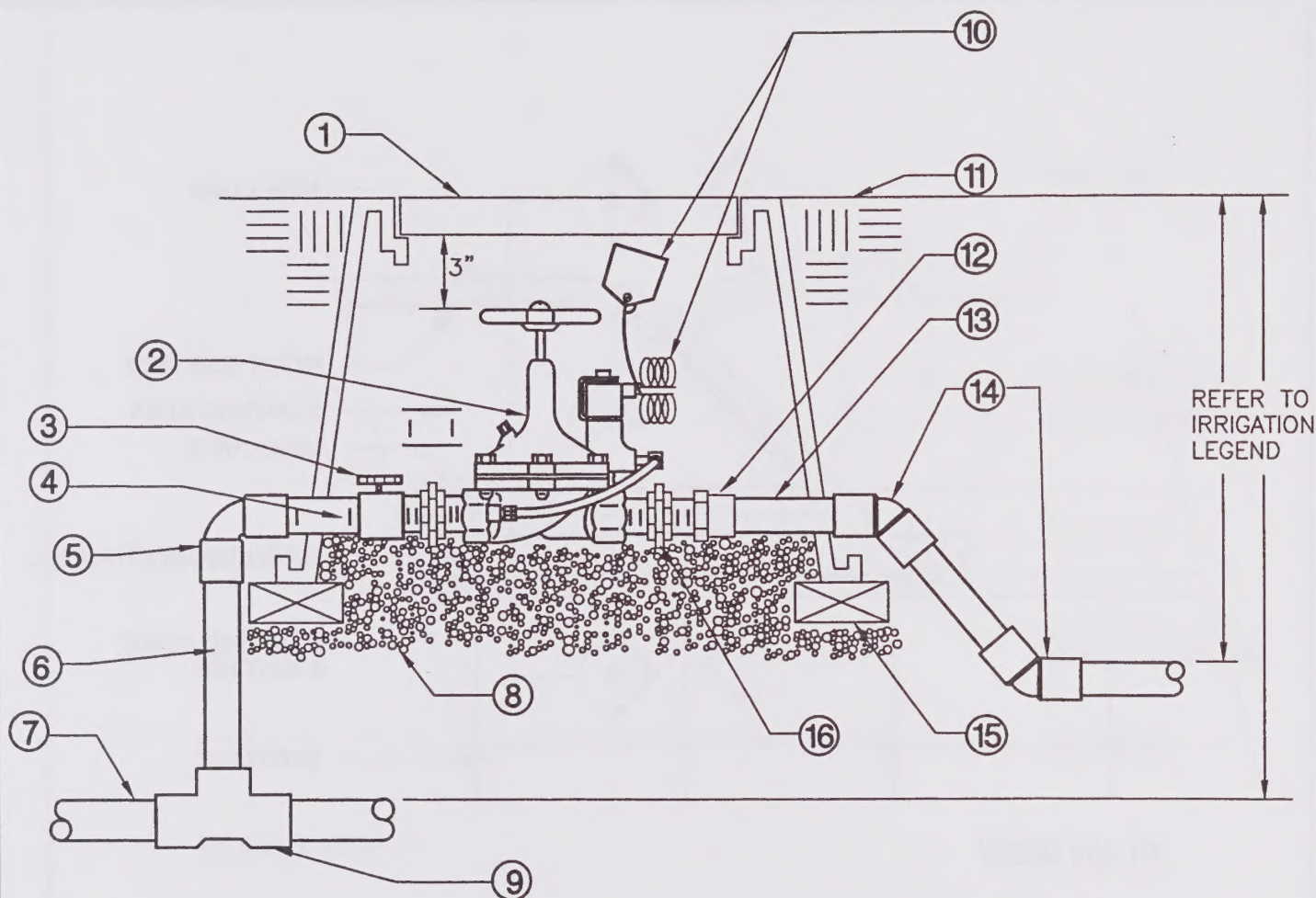


SECTION A-A

U-4

BULB - OUT CONDITION C

SCALE 1/4" = 1'-0"

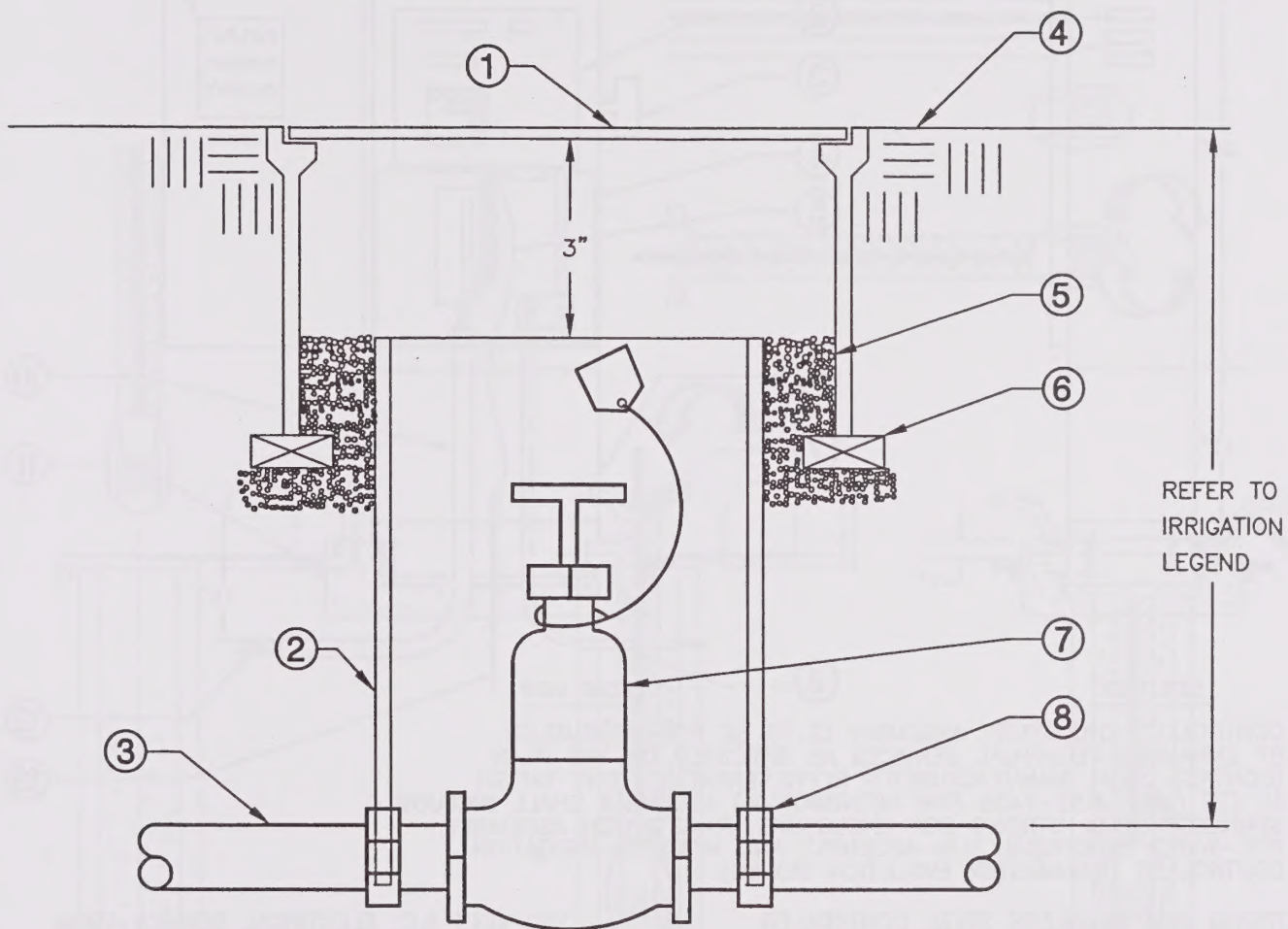


- | | |
|--|---|
| <p>① PURPLE RECTANGULAR PLASTIC VALVE BOX WITH BOLT DOWN LID. ONE VALVE PER BOX— NO EXCEPTIONS. INSTALL BOX AS SHOWN IN BOX INSTALLATION DETAIL. TOP DIMENSION: 11 3/4" X 17" (12" DEEP)</p> <p>② REMOTE CONTROL VALVE WITH FLOW CONTROL AND MANUAL BLEED</p> <p>③ GATE VALVE (LINE SIZE) INSTALL ON UPSTREAM SIDE OF RCV (TYPICAL)</p> <p>④ SCHEDULE 80 PVC NIPPLES (TWO)</p> <p>⑤ SCHEDULE 40 PVC 90° ELBOW (SXT)</p> <p>⑥ SCHEDULE 40 PVC RISER— LENGTH AS REQUIRED.</p> <p>⑦ PVC MAIN LINE</p> <p>⑧ PEA GRAVEL— 4" DEEP BELOW VALVE (NO SOIL IN VALVE BOX)</p> | <p>⑨ UPC APPROVED SCHEDULE 40 PVC TEE</p> <p>⑩ VALVE CONTROL WIRE— PROVIDE 3M DBY SEAL PACKS AT ALL SPLICES AND 36" OF EXCESS UF WIRE IN A 1" DIAMETER COIL. ATTACH VALVE I.D. TAG (CONTROLLER AND STATION NUMBER) AND RECYCLED WATER WARNING TAG.</p> <p>⑪ FINISH GRADE</p> <p>⑫ SCHEDULE 40 PVC MALE ADAPTER</p> <p>⑬ PVC LATERAL LINE</p> <p>⑭ LOWER LATERAL LINE WITH SCH. 40 PVC 45° ELBOWS</p> <p>⑮ BRICK—1 EACH CORNER</p> <p>⑯ SCHEDULE 80 PVC THREADED UNION—2 TOTAL</p> |
|--|---|

I-1

REMOTE CONTROL VALVE

Scale: NONE
Det: RCV



① PURPLE ROUND PLASTIC VALVE BOX WITH BOLT DOWN LID. TOP DIMENSION: 10".

② 8" CLASS 160 OR SCHEDULE 40 PVC PIPE (NOTCH TO FIT OVER MAIN LINE PIPE)

③ PVC MAIN LINE

④ FINISH GRADE

⑤ PEA GRAVEL

⑥ BRICK-2 TOTAL

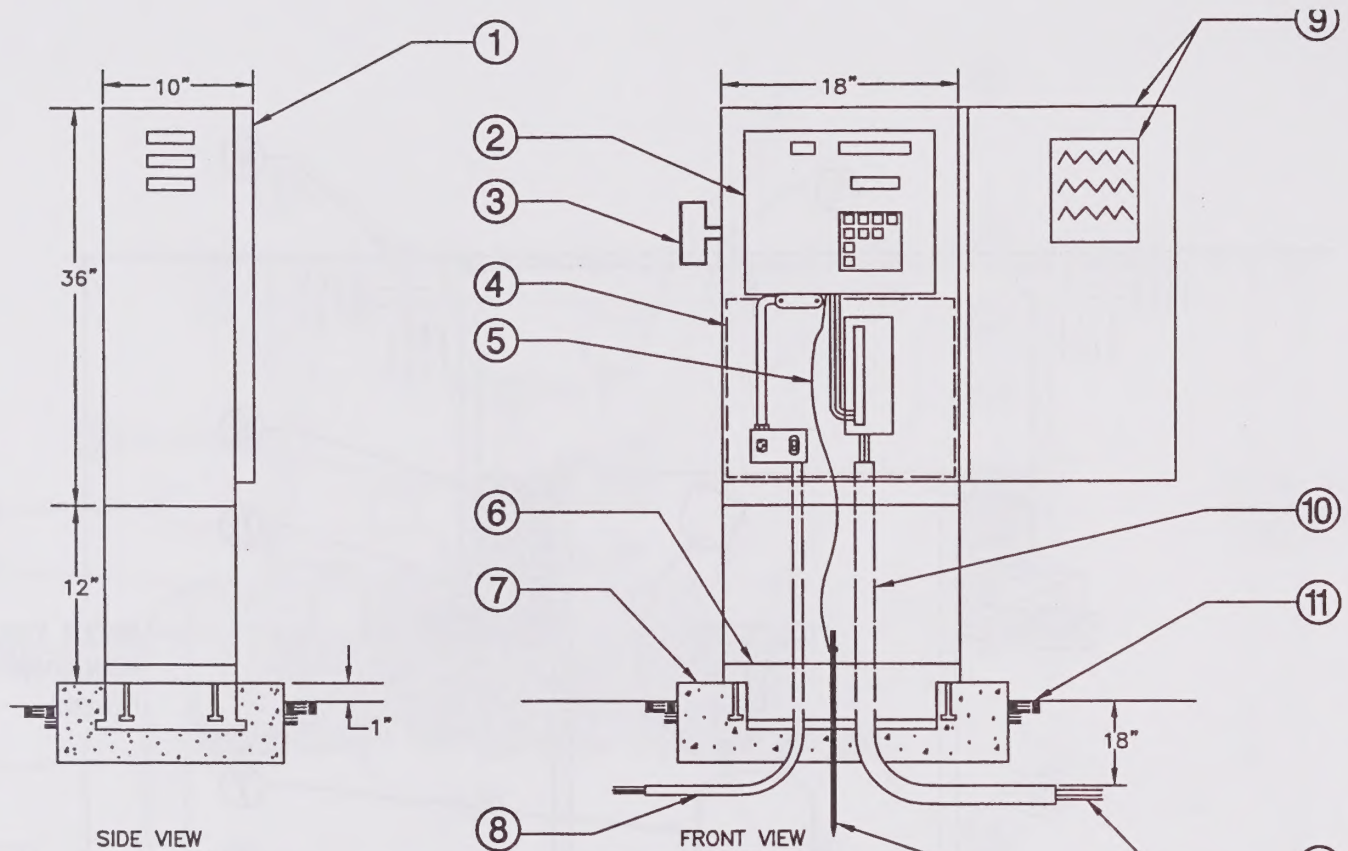
⑦ GATE VALVE WITH RECYCLED WATER WARNING TAG

⑧ SCHEDULE 40 PVC MALE ADAPTER

1-2

3' AND SMALLER GATE VALVE

Scale: NONE
Det: SGVD



NOTE: CONTROLLER ENCLOSURE ASSEMBLY IS TO BE PRE-ASSEMBLED BY ENHANCED TECHNICAL SERVICES AS SPECIFIED ON THE PLAN (CONTACT LOCAL MANUFACTURER'S REPRESENTATIVE, TONY YARISH AT ETS (888) 438-7435 FOR INFORMATION.) ASSEMBLY SHALL INCLUDE STAINLESS STEEL STRONG BOX ENCLOSURE, RAIN SWITCH ASSEMBLY, PRE-WIRED ELECTRICAL SUB-ASSEMBLY AND MOUNTED IRRIGATION CONTROLLER (RAINMASTER EVOLUTION SERIES).

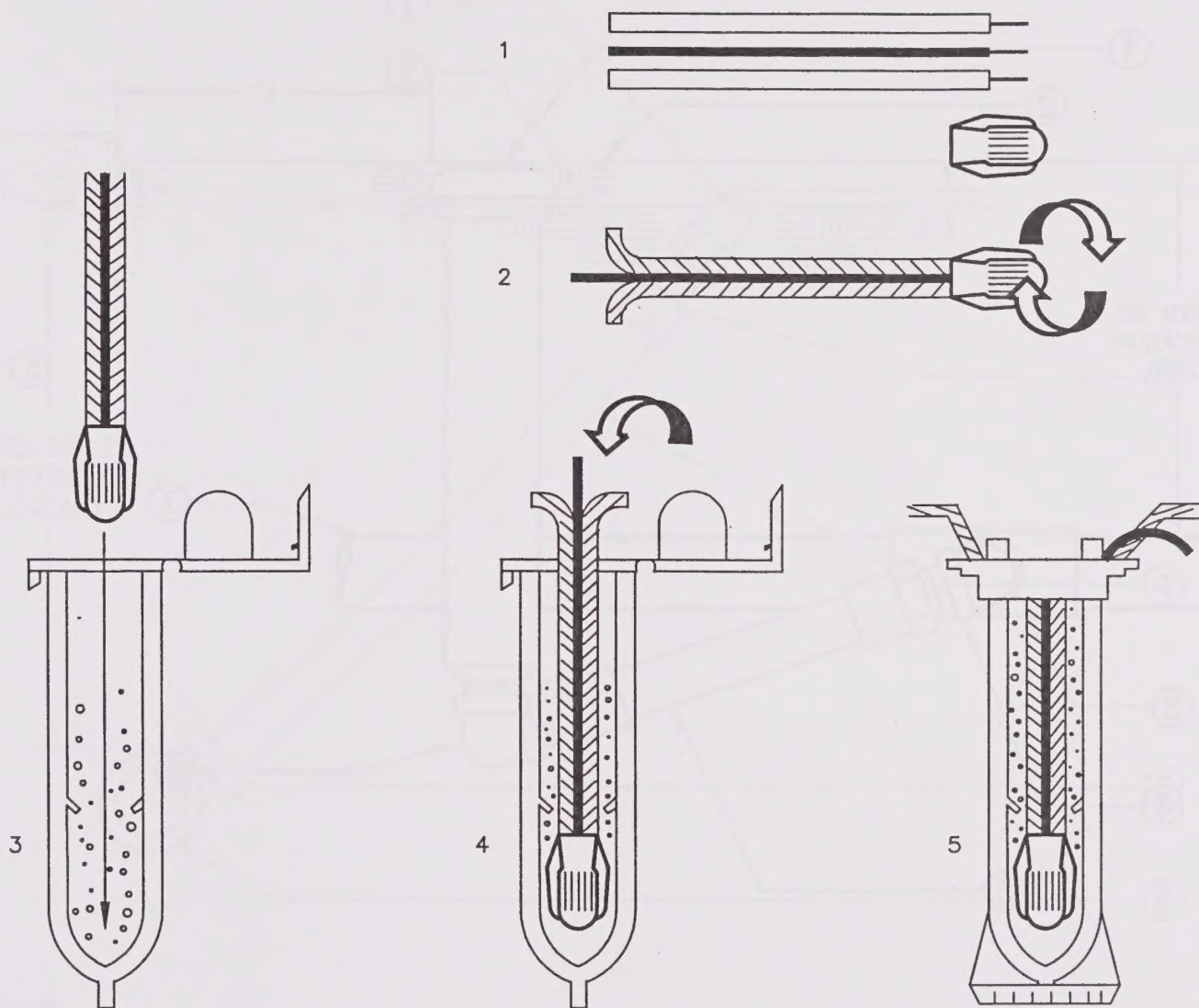
- | | |
|--|--|
| <p>① STRONG BOX STAINLESS STEEL CONTROLLER ENCLOSURE MODEL #SB-18 SS.</p> <p>② CONTROLLER TO BE MOUNTED ON MOUNTING PANEL OF ENCLOSURE</p> <p>③ RAIN SHUT-OFF DEVICE</p> <p>④ CONTROLLER SUBASSEMBLY #CSA</p> <p>⑤ #10 BARE COPPER GROUND WIRE</p> <p>⑥ STEEL BASE WITH MOUNTING STUDS INCLUDED WITH ENCLOSURE</p> <p>⑦ 6" THICK CONCRETE SLAB TO EXTEND 6" BEYOND THREE SIDES OF ENCLOSURE AND 12" BEYOND FRONT</p> | <p>⑧ 120 VOLT A.C. ELECTRICAL SERVICE FROM SOURCE TO CONTROLLER LOCATION PROVIDED BY ELECTRICAL CONTRACTOR. IRRIGATION CONTRACTOR TO PROVIDE RIGID STEEL CONDUIT FROM SERVICE STUB-OUT TO CONTROLLER GCFI. SWITCH AND COMPLETE ELECTRICAL SERVICE TO CONTROLLER</p> <p>⑨ ENCLOSURE DOOR WITH RECYCLED WATER WARNING TAG-MOUNT ON INSIDE OF CONTROLLER DOOR.</p> <p>⑩ SCHEDULE 40 GREY PVC ELECTRICAL CONDUIT WITH SWEEP ELL FOR LOW VOLTAGE WIRE PROVIDED UNDER IRRIGATION CONTRACT</p> <p>⑪ FINISH GRADE</p> <p>⑫ LOW VOLTAGE CONTROL WIRE (EXTEND CONDUIT 12" BEYOND CONCRETE SLAB). ADD EXTRA WIRE TO CONTROL WIRE BUNDLE. SEE DETAIL I-8 FOR CONTROL WIRE INSTALLATION.</p> <p>⑬ 8' GROUNDING ROD (INSIDE ENCLOSURE)</p> |
|--|--|

I-3

CONTROLLER IN ENCLOSURE

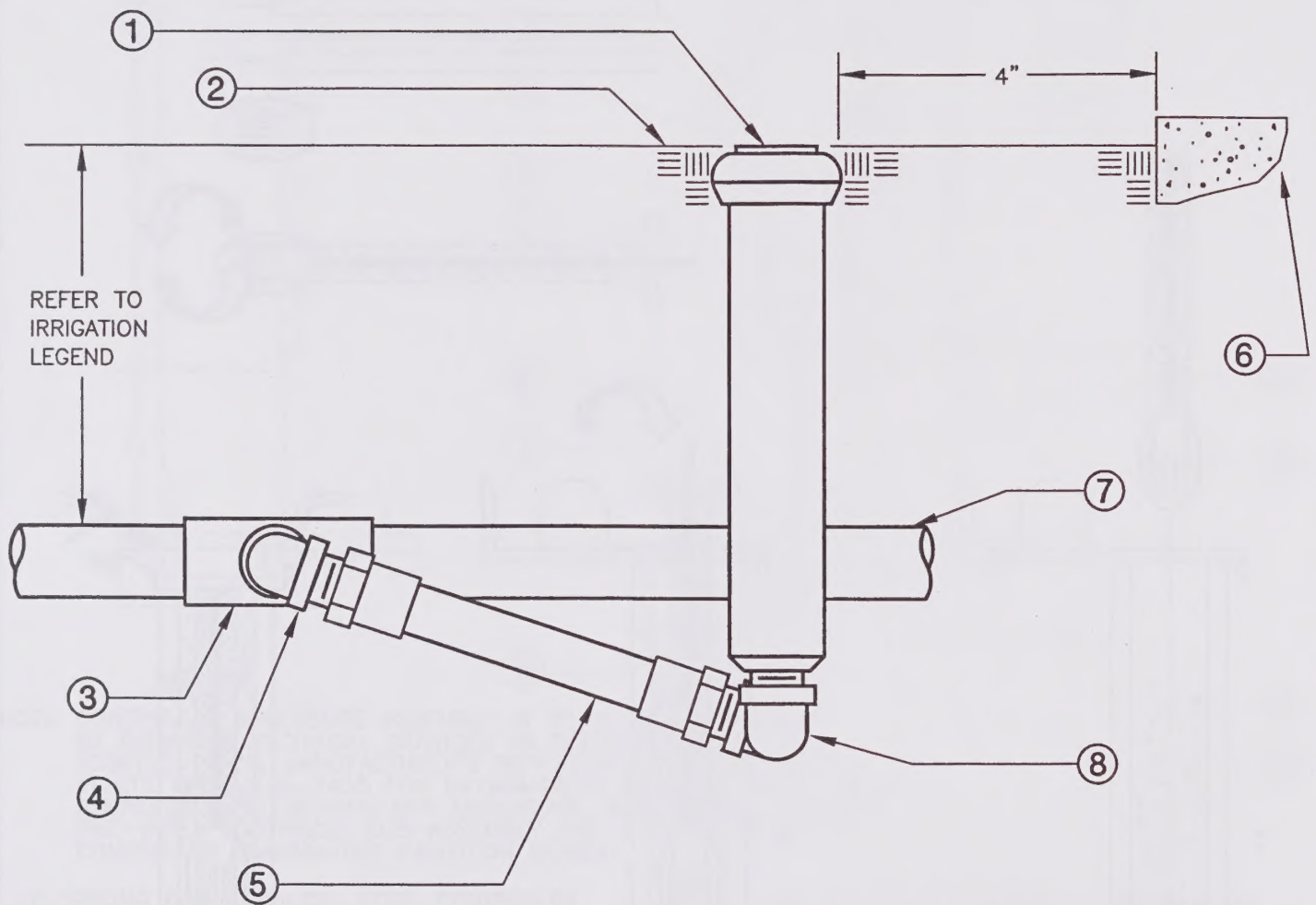
Scale: NONE

Det CNT-ENC5



INSTRUCTIONS:

1. STRIP WIRES APPROXIMATELY 1/2" (12.7 MM) TO EXPOSE WIRE.
2. TWIST CONNECTOR AROUND WIRES CLOCKWISE UNTIL HAND TIGHT, DO NOT OVERTIGHTEN.
3. INSERT WIRE ASSEMBLY INTO PLASTIC TUBE UNTIL WIRE CONNECTOR SNAPS PAST LIP IN BOTTOM OF TUBE.
4. PLACE WIRES WHICH EXIT TUBE IN WIRE EXIT HOLES AND CLOSE CAP UNTIL IT SNAPS.
5. INSPECT FINAL SPLICE ASSEMBLY TO BE SECURE AND FINISHED.



① 12" POP-UP SHRUB ROTARY SPRINKLER WITH RECYCLED WATER CAP

② FINISH GRADE

③ UPC APPROVED SCHEDULE 40 PVC TEE OR ELBOW

④ 3/4" SCHEDULE 40 PVC STREET ELL

⑤ 3/4" KING BROS. FLEX RISER MODEL FR-750-6 OR EQUAL

⑥ WALL, WALK, CURB OR BUILDING

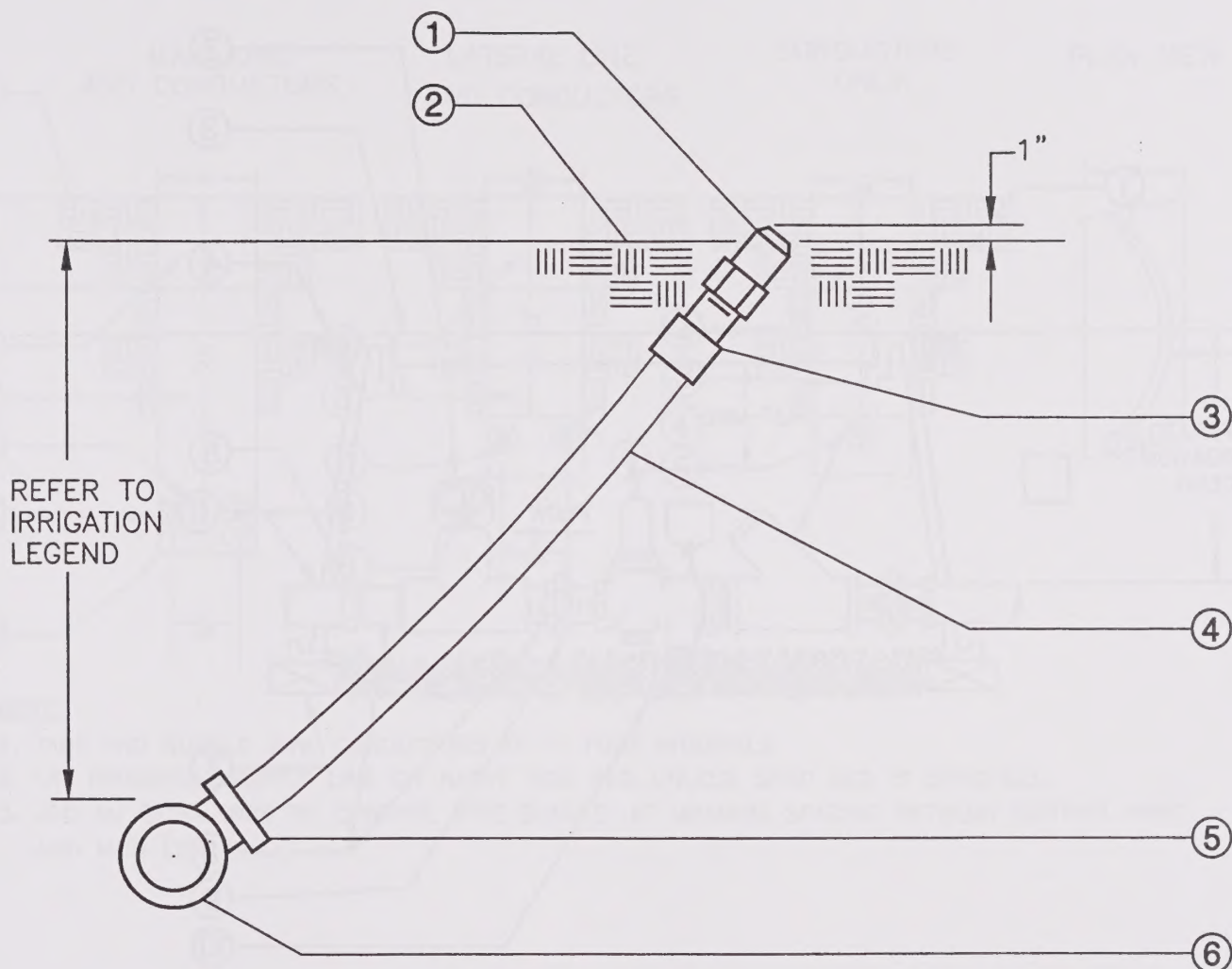
⑦ PVC LATERAL LINE

⑧ MARLEX 90° STREET ELL (2 TOTAL)

1-5

12" POP-UP SHRUB ROTARY SPRINKLER RISER

Scale: NONE
Det: 12POP-UP



NOTE:

INSTALL BUBBLER WITHIN TREE BASIN ON TOP OF ROOTBALL AT A MAXIMUM OF 12" FROM TREE TRUNK.

① BUBBLER WITH SHRUB ADAPTER AND EFFLUENT CAP

② FINISH GRADE

③ 1/2" PVC MALE ADAPTER. INSTALL SPRING LOADED CHECK VALVE BETWEEN MALE ADAPTER AND BUBBLER NOZZLE WHERE NECESSARY TO CONTROL LOW OUTLET DRAINAGE.

④ 1/2" IPS FLEXIBLE HOSE (PVC) (.840 O.D.) USE ONLY IPS WELD-ON #795 SOLVENT CEMENT WITH P-70 PRIMER ON THIS HOSE.

⑤ PVC TEE OR ELBOW

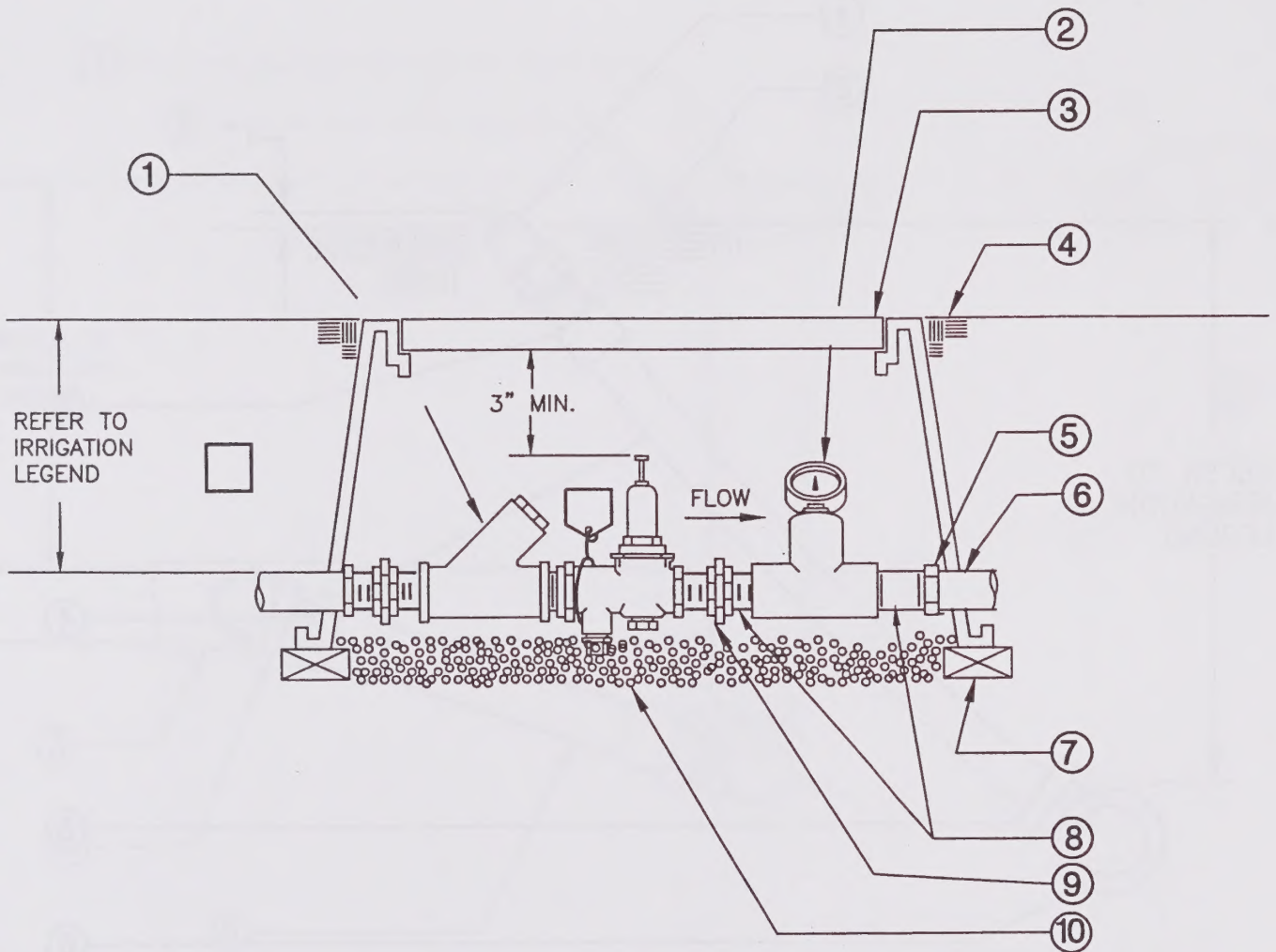
⑥ PVC LATERAL LINE

1-6

TREE BUBBLER

Scale: NONE

Det: TREEBUBL

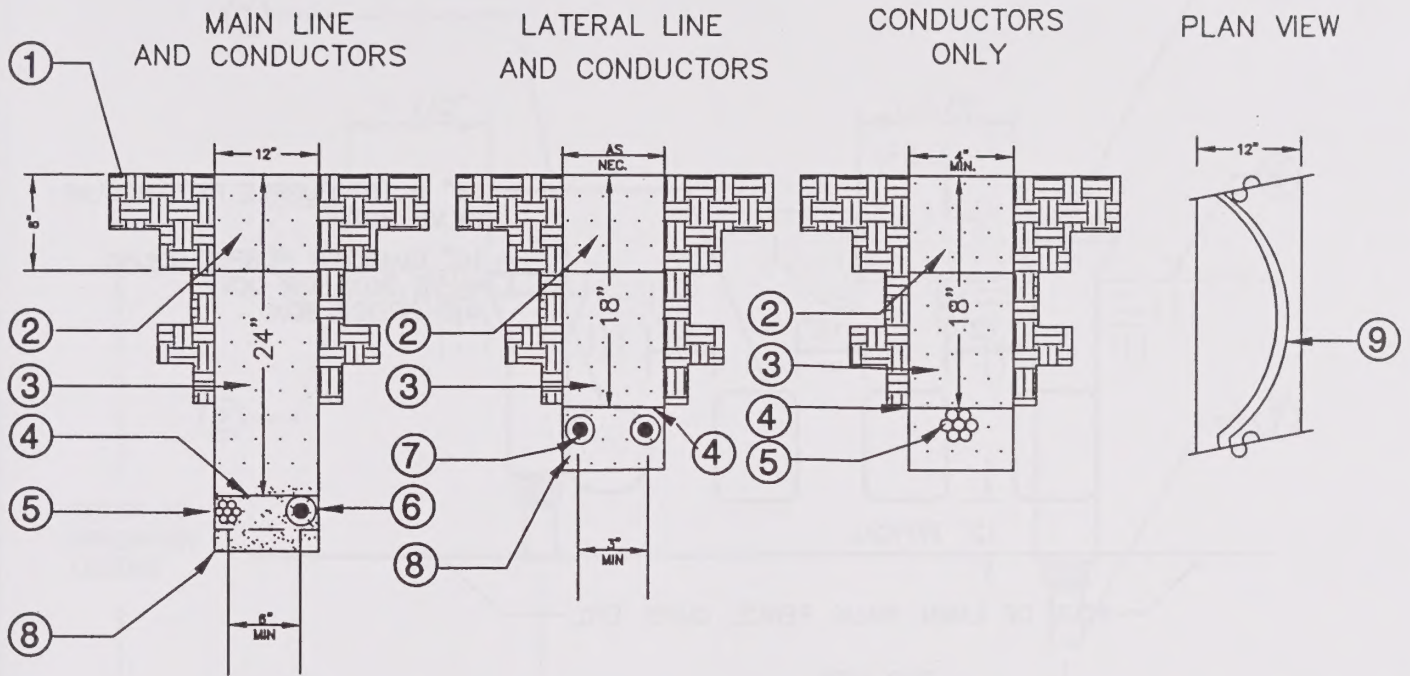


- | | |
|---|---|
| <p>① WILKINS MODEL 500 YSBR PRESSURE REDUCING VALVE AND WYE STRAINER ASSEMBLY—SIZE AS NOTED ON DRAWINGS. ATTACH RECYCLED WATER WARNING TAG.</p> <p>② IRROMETER MODEL 7-100 OR APPROVED EQUAL (0-100 PSI) PRESSURE GAUGE — ROTATE TEE FOR EASE OF READING.</p> <p>③ PURPLE RECTANGULAR PLASTIC VALVE BOX WITH BOLT- DOWN LID. INSTALL BOX AS SHOWN IN BOX INSTALLATION DETAIL. TOP DIMENSION: 15 3/4" X 25 1/4" (15" DEEP)</p> <p>④ FINISH GRADE</p> | <p>⑤ SCHEDULE 40 PVC MALE ADAPTER —2 TOTAL</p> <p>⑥ PVC MAIN LINE</p> <p>⑦ BRICK — ONE EACH CORNER OF BOX</p> <p>⑧ SCHEDULE 80 PVC THREADED NIPPLES AND FITTINGS AS REQUIRED</p> <p>⑨ SCHEDULE 80 PVC THREADED UNION—2 TOTAL</p> <p>⑩ PEA GRAVEL — 4" DEEP (NO SOIL IN VALVE BOX)</p> |
|---|---|

I-7

PRESSURE REDUCING VALVE ASSEMBLY

Scale: NONE
Det: PRV

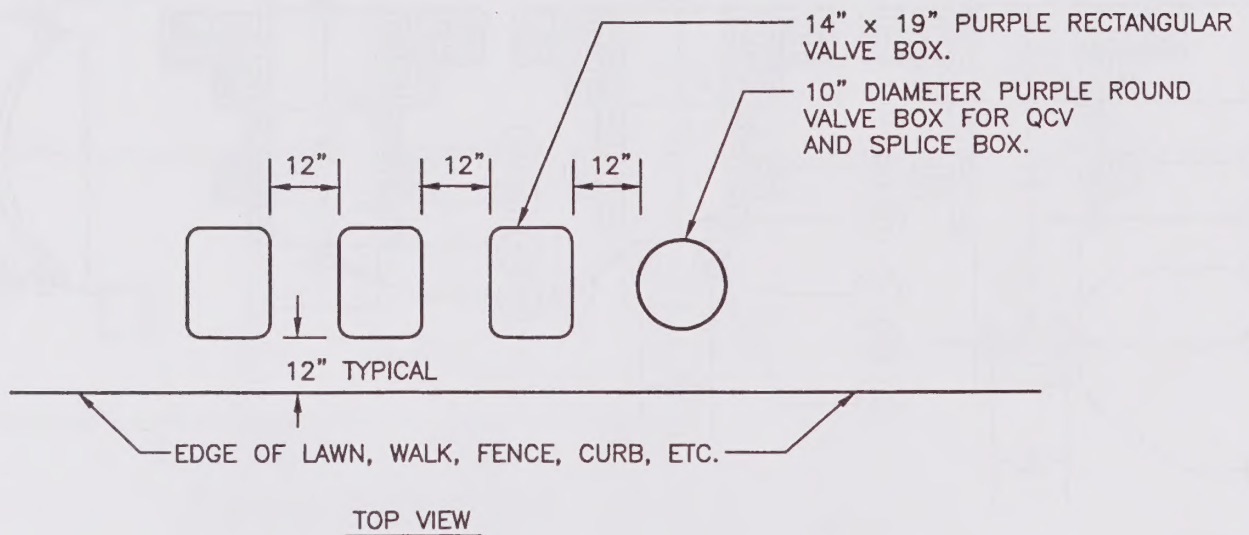


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|--------------------------------------|---------------------------------------|
| ① FINISH GRADE (TYPICAL) | ⑥ IRRIGATION MAIN LINE |
| ② COMPACTED SOIL BACKFILL - 8" DEPTH | ⑦ IRRIGATION LATERAL LINE |
| ③ SAND BACKFILL | ⑧ SAND BED - 3" DEPTH |
| ④ METAL DETECTOR TAPE ENTIRE LENGTH | ⑨ SNAKE ALL PIPE IN TRENCHES AS SHOWN |
| ⑤ IRRIGATION CONTROL WIRING | |

1-8

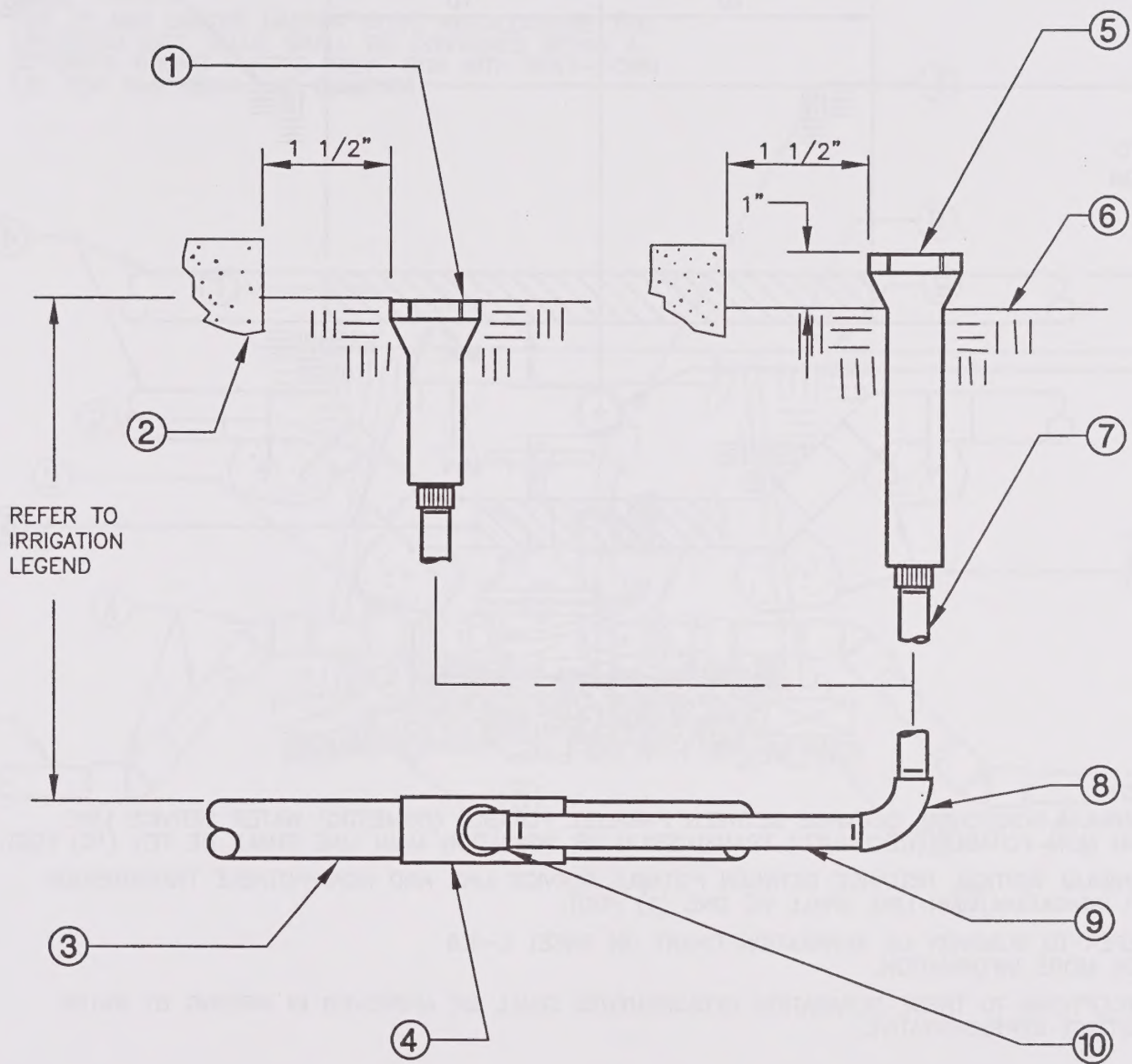
TRENCHING AND INSTALLATION

Scale: NONE
Det: Trench1



INSTRUCTIONS:

1. CENTER VALVE BOX OVER REMOTE CONTROL VALVE TO FACILITATE SERVICING VALVE.
2. SET BOXES 1" ABOVE FINISH GRADE OR MULCH COVER IN GROUND COVER/SHRUB AREA AND FLUSH WITH FINISH GRADE IN TURF AREA.
3. SET RCV AND VALVE BOX ASSEMBLY IN GROUND COVER/SHRUB AREA WHERE POSSIBLE. INSTALL IN LAWN ONLY IF GROUND COVER DOES NOT EXIST ADJACENT TO LAWN.
4. SET BOXES PARALLEL TO EACH OTHER AND PERPENDICULAR TO EDGE OF LAWN, WALK, FENCE, CURB, ETC.
5. AVOID HEAVILY COMPACTING SOIL AROUND VALVE BOXES TO PREVENT COLLAPSE AND DEFORMATION OF VALVE BOX SIDES.
6. INSTALL EXTENSION BY VALVE BOX MANUFACTURER AS REQUIRED TO COMPLETELY ENCLOSE ASSEMBLY FOR EASY ACCESS.



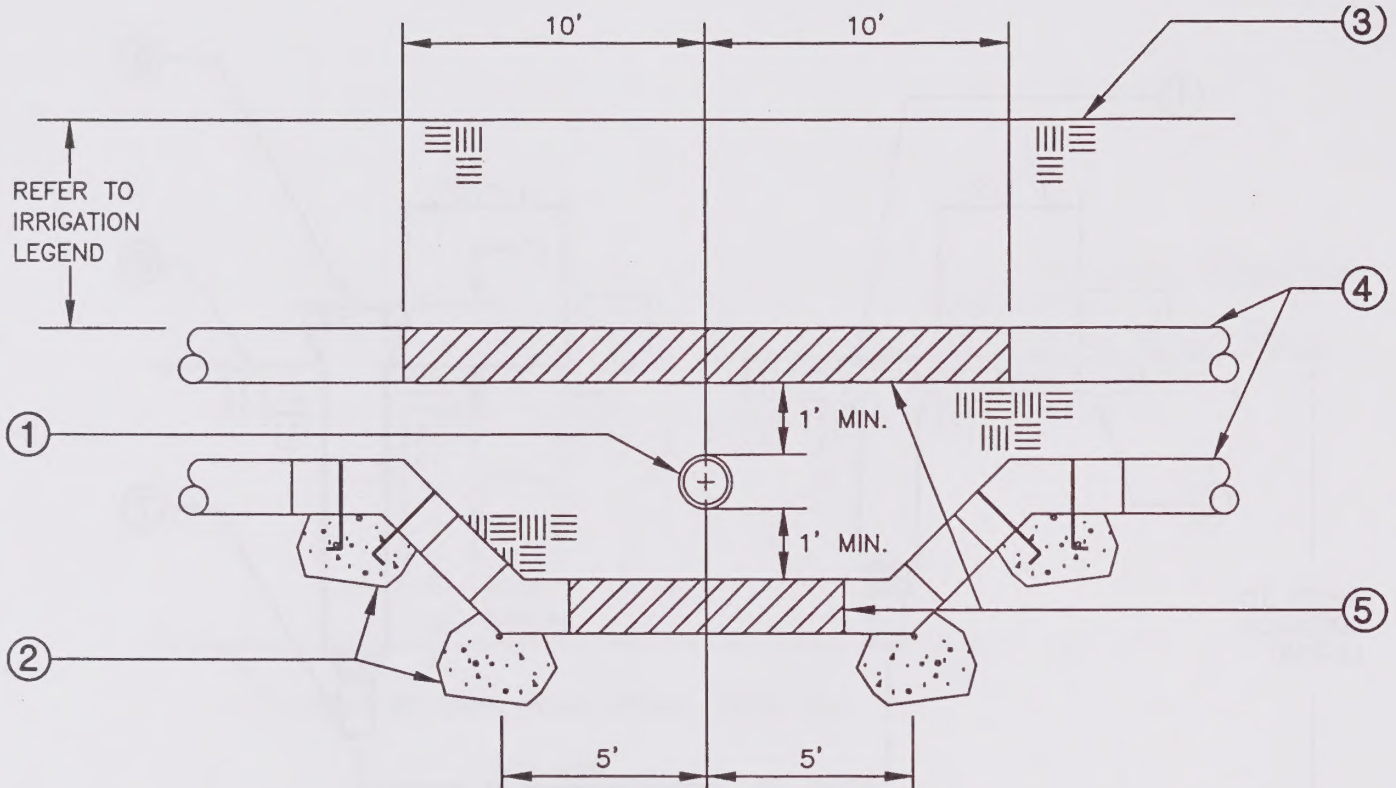
- ① POP-UP LAWN SPRAY SPRINKLER WITH EFFLUENT CAP.
- ② WALL, WALK, CURB OR BUILDING
- ③ PVC LATERAL LINE
- ④ UPC APPROVED SCHEDULE 40 PVC TEE OR ELBOW
- ⑤ POP-UP SHRUB SPRAY SPRINKLER OR STREAM BUBBLER WITH EFFLUENT CAP

- ⑥ FINISH GRADE
- ⑦ 1/2" SCHEDULE 80 PVC THREADED NIPPLE (LENGTH AS REQUIRED - TYPICAL)
- ⑧ 1/2" SCHEDULE 40 PVC THREADED 90° ELL
- ⑨ 1/2" X 6" LONG SCHEDULE 80 PVC THREADED NIPPLE.
- ⑩ 1/2" SCHEDULE 40 PVC STREET ELL

I-10

POP-UP SPRAY SPRINKLER RISER

Scale: NONE
Det: P-USSR2



NOTES:

1. MINIMUM HORIZONTAL DISTANCE BETWEEN PARALLEL POTABLE (DOMESTIC) WATER SERVICE LINE AND NON-POTABLE (RECLAIMED) TRANSMISSION OR IRRIGATION MAIN LINE SHALL BE TEN (10) FEET.
2. MINIMUM VERTICAL DISTANCE BETWEEN POTABLE SERVICE LINE AND NON-POTABLE TRANSMISSION OR IRRIGATION MAIN LINE SHALL BE ONE (1) FOOT.
3. REFER TO SUMMARY OF SEPARATION CHART ON SHEET L-1.6 FOR MORE INFORMATION.
4. EXCEPTIONS TO THESE SEPARATION REQUIREMENTS SHALL BE APPROVED IN WRITING BY WATER DISTRICT REPRESENTATIVE.

① EXISTING POTABLE WATER LINE

⑤ NO JOINTS ALLOWED IN THIS SECTION

② THRUST BLOCKS AS DETAILED

③ FINISH GRADE

④ NON POTABLE MAINLINE
(TRANSMISSION OR IRRIGATION)

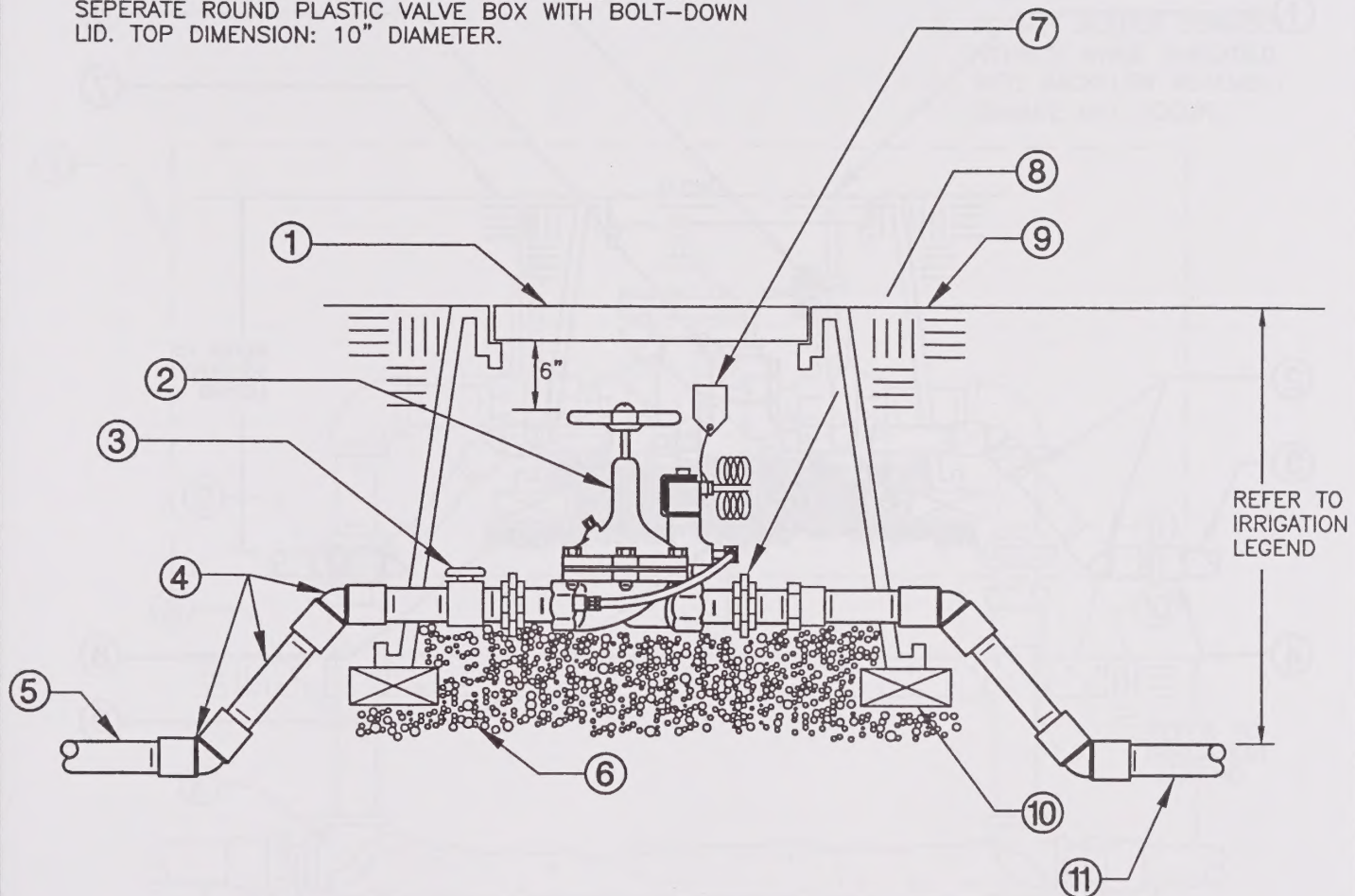
I-11

POTABLE/NON-POTABLE WATER LINE CROSSING

Scale: NONE
Det: NEW-POT

NOTE:

FOR 2" AND LARGER MASTER VALVE INSTALLATIONS THE UPSTREAM GATE VALVE SHALL BE CONTAINED WITHIN A SEPERATE ROUND PLASTIC VALVE BOX WITH BOLT-DOWN LID. TOP DIMENSION: 10" DIAMETER.



- ① PURPLE RECTANGULAR PLASTIC VALVE BOX WITH BOLT DOWN "T" LID. ONE VALVE PER BOX— NO EXCEPTIONS. INSTALL BOX AS SHOWN IN BOX INSTALLATION DETAIL. TOP DIMENSIONS: 11 3/4" X 17" (12" DEEP)
- ② MASTER CONTROL VALVE WITH FLOW CONTROL AND MANUAL BLEED
- ③ GATE VALVE (LINE SIZE)
- ④ SCHEDULE 80 PVC NIPPLES (TBE) AND 45° THREADED ELBOWS (TYPICAL FOR BOTH SIDES OF VALVE)
- ⑤ PVC MAIN LINE—CONNECT TO SCHEDULE 80 PVC WITH PVC SOLVENT WELD COUPLING
- ⑥ PEA GRAVEL—4" DEEP BELOW VALVE (NO SOIL IN VALVE BOX)

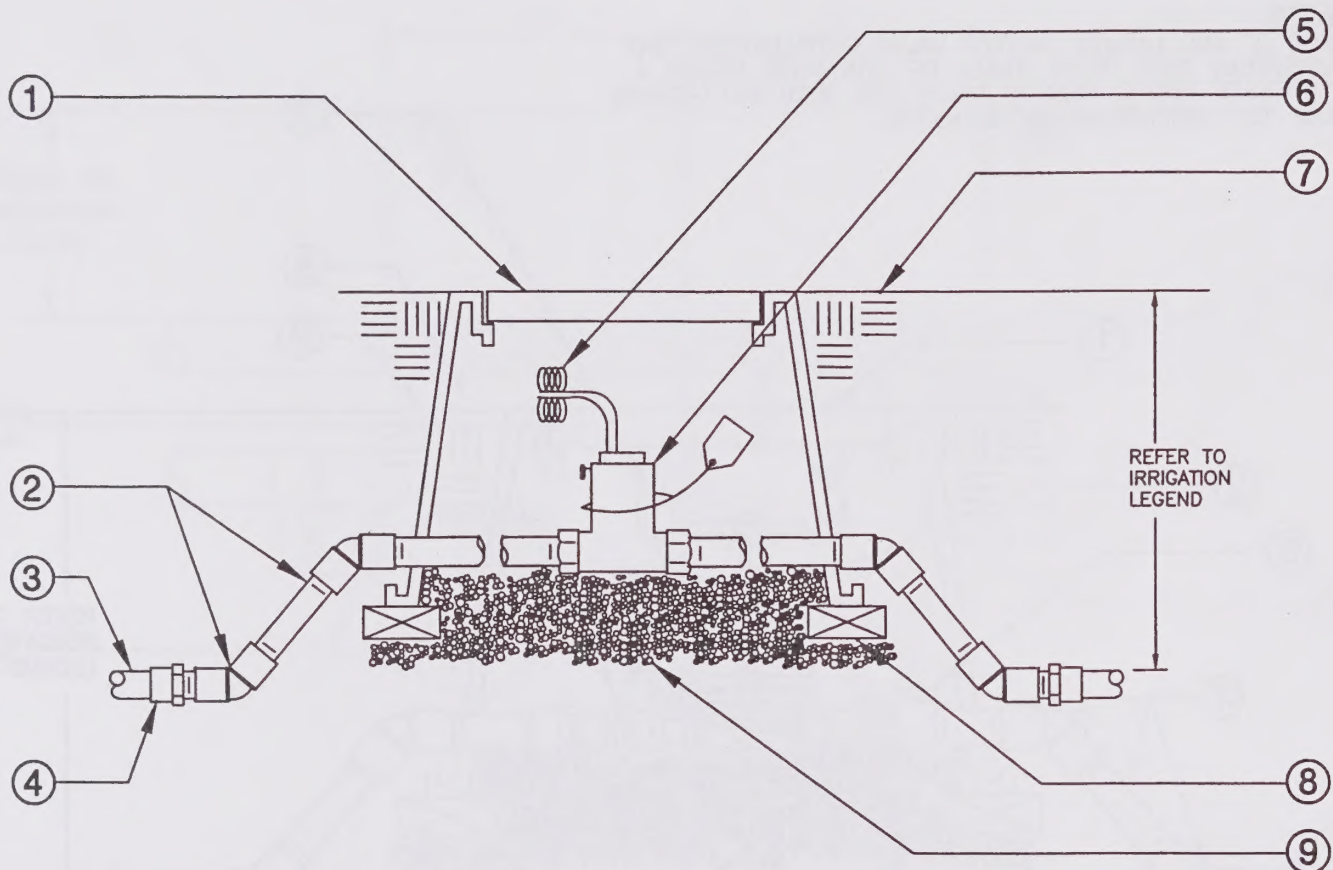
- ⑦ VALVE CONTROL WIRE— PROVIDE 3M DBY SEAL PACKS AT ALL SPLICES AND 36" OF EXCESS UF WIRE IN A 1" DIAMETER COIL. ATTACH RECYCLED WATER WARNING TAG.
- ⑧ SCHEDULE 80 PVC THREADED UNION (2 TOTAL)
- ⑨ FINISH GRADE
- ⑩ BRICK—1 EACH CORNER
- ⑪ PVC MAIN LINE TO FLOW SENSOR. CONNECT TO SCHEDULE 80 PVC WITH PVC SOLVENT WELD COUPLING.

I-12

MASTER CONTROL VALVE

Scale: NONE

Det: MASTER-V



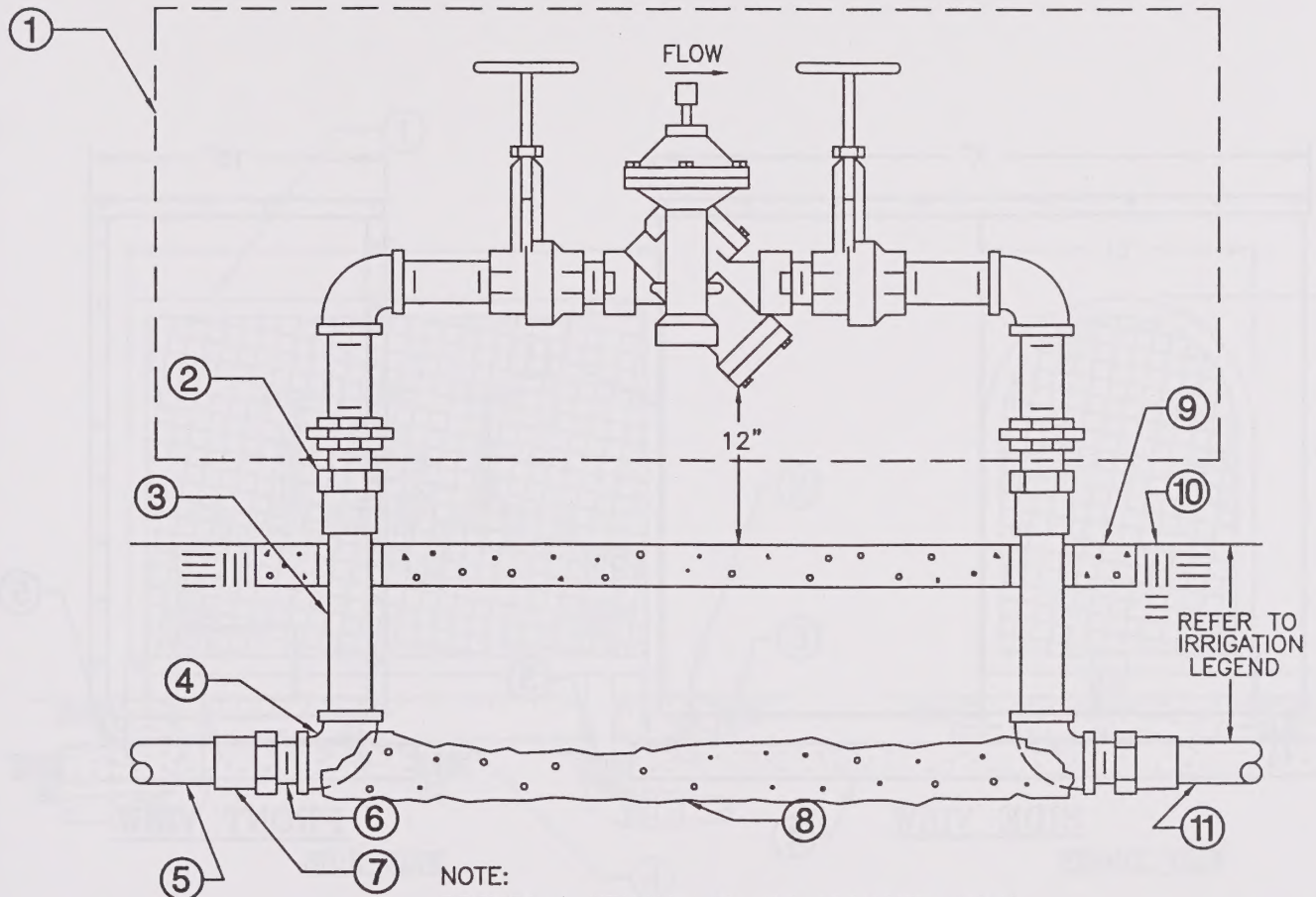
NOTE:

THE CONTRACTOR SHALL INSTALL FLOW SENSOR TO ALLOW STRAIGHT-FLOW OF A MINIMUM OF TEN TIMES THE DIAMETER OF MAINLINE PIPE ON THE INLET SIDE AND FIVE TIMES THE DIAMETER OF MAIN LINE PIPE ON THE OUTLET SIDE OF THE SENSOR.

- | | |
|--|--|
| <p>① PURPLE RECTANGULAR PLASTIC VALVE BOX WITH BOLT DOWN LID. TOP DIMENSION: 11 3/4" x 17" (12" DEEP)</p> <p>② SCHEDULE 80 PVC THREADED NIPPLES AND 45° ELBOWS (AS REQUIRED ON BOTH SIDES OF SENSOR)</p> <p>③ PVC MAIN LINE FROM MASTER VALVE</p> <p>④ UPC APPROVED SCHEDULE 40 PVC MALE ADAPTER (2 TOTAL)</p> <p>⑤ SENSOR CONTROL WIRE—PROVIDE 3M DBY SEAL PACKS AT ALL SPLICES AND 36" OF EXCESS U.F. WIRE IN A 1" DIAMETER COIL</p> | <p>⑥ TEE MOUNTED FUSED FLOW SENSOR—WIRE TO CONTROLLER AS DIRECTED BY MANUFACTURER'S REPRESENTATIVE. ATTACH RECYCLED WATER WARNING TAG.</p> <p>⑦ FINISH GRADE</p> <p>⑧ BRICK — 1 EACH CORNER</p> <p>⑨ PEA GRAVEL—4" DEEP BELOW VALVE (NO SOIL IN VALVE BOX)</p> |
|--|--|

NOTES: 1. ALL FITTINGS AND THREADS TO BE SAME IPT SIZE AS BACKFLOW ASSEMBLY.

2. DO NOT SOLDER CONNECT FITTINGS WHILE THREADED INTO BACKFLOW ASSEMBLY. DAMAGE MAY OCCUR.

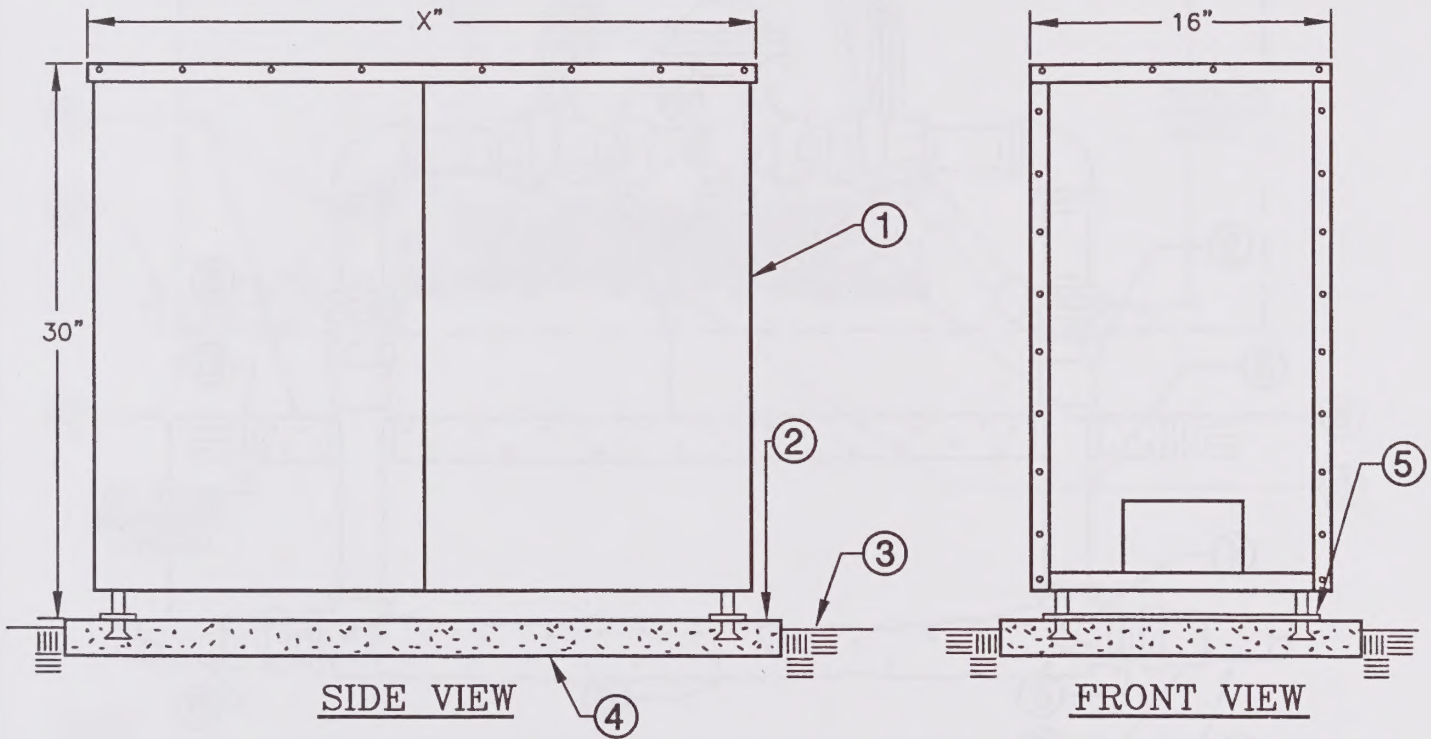


NOTE:
PROVIDE A STRONG BOX, OR ACCEPTED EQUAL BACKFLOW PREVENTER ENCLOSURE TO COMPLETELY ENCLOSE DEVICE. INSTALL ENCLOSURE TO CONCRETE BASE AS DIRECTED BY MANUFACTURER.

- | | |
|---|--|
| ① REDUCED PRESSURE BACKFLOW ASSEMBLY MODEL 975 XLSEU SERIES | ⑦ SCHEDULE 40 PVC MALE ADAPTER—2 TOTAL |
| ② WROT COPPER MALE ADAPTER—2 TOTAL (SOLDER X THREAD CONNECTION) | ⑧ CONCRETE SUPPORT BLOCK |
| ③ COPPER TYPE "K" PIPE (LENGTH AS REQUIRED) | ⑨ CONCRETE PAD—SEE ENCLOSURE DETAIL |
| ④ WROT COPPER 90° ELBOW—2 TOTAL (SOLDER X THREAD CONNECTION) | ⑩ FINISH GRADE |
| ⑤ PVC MAIN LINE TO POINT OF CONNECTION | ⑪ PVC MAIN LINE TO IRRIGATION SYSTEM |
| ⑥ BUSH AS NECESSARY FOR SIZE TRANSITION | |

NOTES:

1. IRRIGATION CONTRACTOR SHALL PROVIDE AND INSTALL BACKFLOW ENCLOSURE BY STRONG BOX.
2. CONTRACTOR SHALL PAINT ENCLOSURE WITH TWO COATS OF RUSTOLEUM AS DIRECTED BY ARCHITECT.



SIZING CHART

WILKINS 975XLSEU	X (INCHES)	ENCLOSURE MODEL NO.
3/4"	15	SBBC-15 ALI
1"	15	SBBC-15 ALI
1 1/4"	30	SBBC-30 ALI
1 1/2"	30	SBBC-30 ALI
2"	30	SBBC-30 ALI

- ① ALUMINUM ENCLOSURE
- ② SET PAD 1/2" ABOVE FINISH GRADE
- ③ FINISH GRADE
- ④ 6" THICK CLASS "B" CONCRETE PAD FOR ENCLOSURE SUPPORT TO EXTEND 6" BEYOND ENCLOSURE ON ALL SIDES. CONCRETE TO HAVE BRUSH FINISH.
- ⑤ STAINLESS STEEL BASE (STANDARD WITH ENCLOSURE) TO BE SET INTO CONCRETE PAD

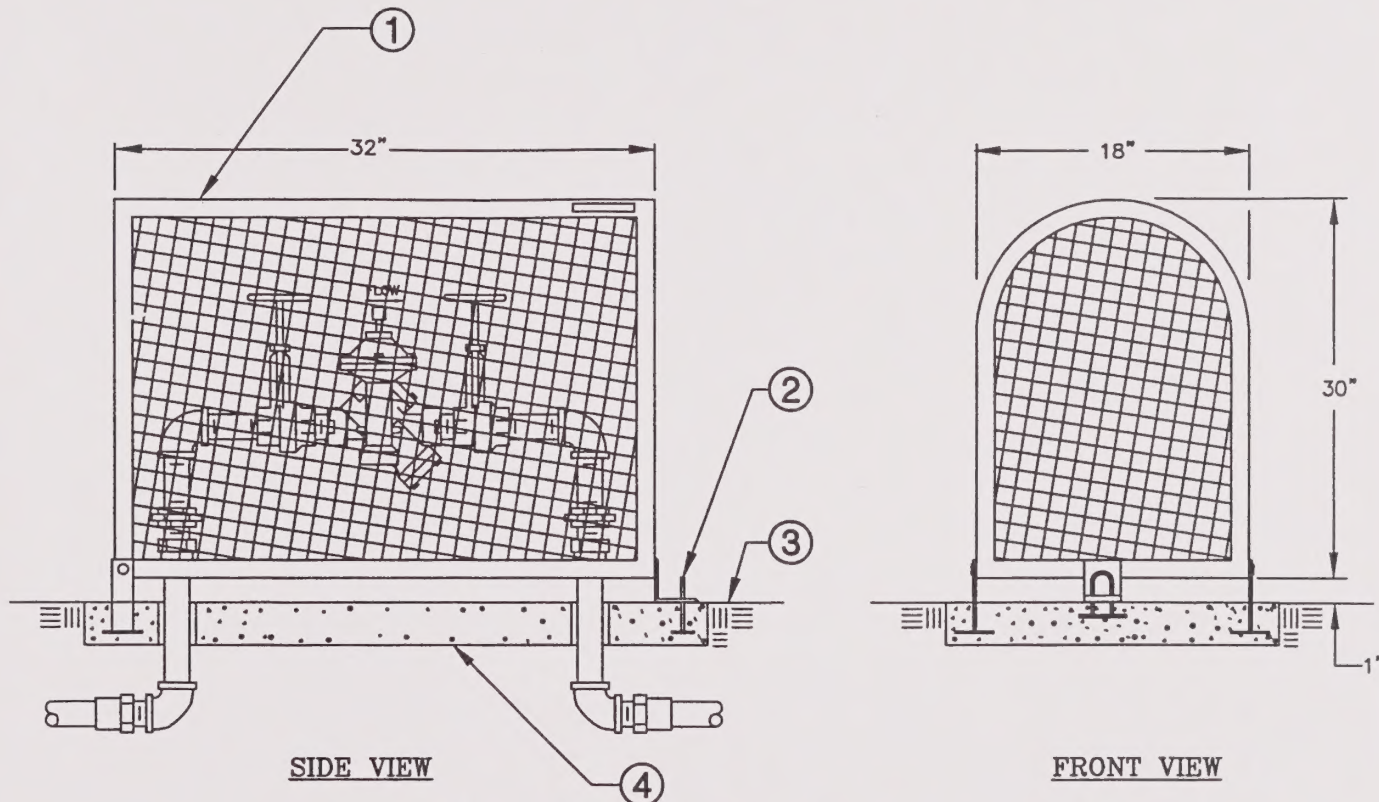
1-15

BACKFLOW PREVENTER ENCLOSURE

Scale: NONE
Det: VITBACK

NOTE:

IRRIGATION CONTRACTOR IS RESPONSIBLE FOR ENCLOSING THE REDUCED PRESSURE BACKFLOW ASSEMBLY IN A STRONG BOX. BACKFLOW PREVENTER ENCLOSURE MODEL #SBBC-30SS, OR APPROVED EQUAL. THIS ENCLOSURE SHALL BE FIRMLY SUPPORTED BY CONCRETE PAD AS DETAILED. CONTACT STRONG BOX AT (800)729-1314 FOR FURTHER REQUIREMENTS. IRRIGATION CONTRACTOR IS RESPONSIBLE FOR ENCLOSING THE REDUCED PRESSURE BACKFLOW ASSEMBLY IN A WEATHER GUARD INSULATED BLANKET BY WORLD WIDE CANVAS PRODUCTS (707) 644-6721, OR APPROVED EQUAL.



ENCLOSURE SIZING:

THIS UNIT WILL COVER A WILKINS
975XLSEU BACKFLOW PREVENTER
UP TO 2" IN SIZE.

- ① STAINLESS STEEL SMOOTH TOUCH BACKFLOW ENCLOSURE
- ② 3/8 U-BOLT FOR PADLOCKING
- ③ FINISH GRADE
- ④ 6" THICK CLASS "B" CONCRETE PAD FOR ENCLOSURE
SUPPORT TO EXTEND 6" BEYOND ENCLOSURE ON ALL SIDES.

1-16

BACKFLOW ENCLOSURE

Scale: NONE
Det: Lemeur1

APPENDIX III

Volunteer and Community Based Tree Programs

Volunteer and Community-Based Tree Programs

A. E-mail and Web-site Contacts:

<i>Organization</i>	<i>e-mail or web site</i>
California Oak Foundation	oakstaff@californiaoaks.org
California Urban Forests Council	cufc@pacbell.net
Trees for Palo Alto	info@canopy.org ; www.canopy.org
Friends of the Urban Forest	info@fuf.net ; www.fuf.net
Greenspace, the Cambria Land Trust	www.greenspacecambria.org
MAGIC	magic@ecomagic.org ; www.ecomagic.org
City of Union City Tree & Landscape Board	rkssealana@aol.com
Marin ReLeaf	www.marinreleaf.org
National AIDS Memorial Grove	AIDSMEMGRV@aol.com
People for Trees	pft@peoplefortrees.org
Redwood Recovery	Grow4Good@aol.com
Sacramento Tree Foundation	www.sactree.com
Santa Margarita Community Forestry	bgingg@smfc.org ; www.smfc.org
Friends of Sunnyvale Community Forest	www.jps.net/hwatease
TREE Davis	treedavi@dcn.davis.ca.us
Tree Musketeers	info@TreeMusketeers.org
Vacaville Tree Foundation	phytosphere@communityonline.net

B. Community Based Tree Programs and Information Sources for Volunteers

Project Learning Tree

Project Learning Tree is an award-winning environmental education program designed for teachers and other educators of students in grades preK-12.

Urban Forest Ecosystems Institute

Based at Cal Poly, this institute was developed to address the increasing need for improved management of the urban forests in California.

City of Milpitas Streetscape Master Plan

Los Angeles Bureau of Street Maintenance: Street Tree Division

With an estimated 680,000 street trees valued at \$2 billion planted on over 6,500 miles of streets, the City of Los Angeles contains one of the largest urban forests in the country.

Bay Area Action

An environmental education and action organization located in the San Francisco Bay area.

California Native Plant Society

A statewide non-profit organization of amateurs and professionals with a common interest in California's native plants.

California Rare Fruit Growers, Inc.

Founded in 1968, California Rare Fruit Growers is the largest amateur fruit-growing organization in the world, with members in 48 states and U.S. territories, and 30 countries.

Friends of the Los Angeles River

This organization is a forty-year art work to bring the River back to life. Its mission is to revitalize and protect the Los Angeles River and its tributaries, a living urban river system, through creative planning, education and innovative watershed man

San Geronio Volunteer Association

A non-profit group dedicated to protecting the San Bernardino National Forest and the San Geronio Wilderness, and to serving the public visiting the forest.

Save-the-Redwoods League

Since 1918, the Save-the-Redwoods League has worked to conserve California's redwood forest lands by purchasing land from willing sellers at fair market value and donating this land to one of the California Redwood State Parks.

Sierra Nevada Alliance

The Sierra Nevada Alliance is committed to a future that is shaped by the physical and spiritual values of the Sierra, the integrity of its landscape, its human and natural resources, and its communities.

The Environmental Volunteers: Natural Science Educators

The Environmental Volunteers (EV) is a nonprofit organization serving San Mateo and Santa Clara county elementary and middle schools, providing hands-on science education aimed at preserving the environment.

City of Milpitas Streetscape Master Plan

California Urban Forests Council

An information and idea sharing network which provides an information exchange, presents workshops, produces an annual conference, and publishes a quarterly newsletter.

Sunnyvale: Friends of the Sunnyvale Community Forest

This group has produced an illustrated, official street tree list for Sunnyvale

Urban Ecology

Based in Oakland, Urban Ecology, Inc. is a non-profit organization involved in the development of ecologically healthy and socially vital cities and towns.

Visalia Beautification Committee

Works to protect Visalia's natural beauty and honors citizens and businesses who have contributed to its preservation and enhancement.

Our City Forests

Community based tree planting and sustainability program in San Jose.

Friends of the Urban Forest

Community based tree planting and sustainability program in San Francisco.

APPENDIX IV

Tree and Hardscape Program

Funding Mechanisms

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Funding Mechanisms

Tree and Hardscape Program Funding Mechanisms:¹

A. Alternate Funding Sources

Figure 26 provides a list of alternative funding mechanisms that may be applicable for trees and hardscape management programs in the city of Milpitas. A more detailed discussion of many of these mechanisms follows.

A1. Improvement Act of 1911

This act authorizes municipal benefit assessment districts for a variety of public works improvements and provides the legal basis for apportioning assessments in relation to varied benefit levels. Each parcel is assessed in proportion to the total benefit it receives from the scheduled improvements. Chapter 27 of the 1911 Act provides the city council with the authority to require owners of lots fronting on public streets to maintain the sidewalk in such a condition as not to endanger persons or property or interfere with the use of the sidewalk. If the property owner does not make the needed repairs, the city government may repair the sidewalk and assess the cost of the repairs against the property owner. The 1911 Act districts are empowered to construct a wide variety of public improvements including streets, sidewalks, curbs, gutters, street lights, water and sewer facilities, park strips, parks, docks, and related facilities.

A3. Municipal Improvement Act of 1913

Similar to the Improvement Act of 1911, the Municipal Improvement Act of 1913 provides for the individual assessment of parcels in proportion to the total benefit received from the improvement. A wide variety of improvements are authorized for funding under this act, including sidewalks.

A4. Landscaping and Street Lighting Act of 1972

The 1972 Act authorizes the establishment of benefit assessments. Only annual assessments are authorized; bonds are prohibited. This act is comprehensive in coverage of costs related to the construction, installation, and maintenance of street lighting facilities and landscaping systems, including park strip tree removal and care.

¹ Source – Sealana & Associates urban forestry infrastructure survey 1996, amended 1998

TYPE OF FUNDING	WHERE USED	EXPLANATION
General Fund	Many	Includes general property tax, city income tax and sales tax
Landscape & Lighting Districts	Many	1972 Landscape and Lighting Act allows for the design, installation, and maintenance of certain improvements
Utility Billing Tax	Fargo, ND	A tree program was started on 100% of utility taxes. As the department expanded, general funds were gradually added.
Mill Levy	No information	A special assessment specifically for tree care
Capital Improvement Funds	Many	These are funds for improvements that require the issuance of revenue bonds. They often involve specific needs such as tree planting after widespread disasters such as fire, flooding, or Dutch Elm Disease.
Front Foot Assessment	Cincinnati, OH	Real property is assessed a certain amount for each foot of frontage. It could also be done on assessed property value as in Toledo. In Ohio, State law provides for assessment districts.
Special Block/Street Assessments	No information	This assessment can be levied when a majority of homeowners vote to subscribe to a tree planting or maintenance program
Local Bond Issue	Many	Can be used to finance special projects such as park construction. Similar to capital improvement and must be passed by vote.
Building Permits	Colorado Springs, CO	City ordinance sets aside \$25.00 from each building permit issued for new residences to be used to plant a tree in front of the new building.
Vehicle Tax and Gas Tax	Many	City ordinance initiated because of increased maintenance requirements resulting from physical damage to trees by vehicles and air pollution damage by vehicle exhaust
Endowments	No information	Sums of money left to cities are designated specifically for tree care. Note that endowments are usually made to well managed, highly publicized programs.
Subdivision Developer Fees	Gilroy, CA	City ordinance has established a fee per tree that is assessed to developers.
Ordinance Violations	Many	Any fine that is levied for violations of the city tree ordinance is returned to the department responsible for the street tree.
Compensatory Tree Replacement	Cincinnati, OH	City ordinance requires a homeowner who wants to put in a driveway to compensate the city for the loss of trees.
Parking Meter Revenue	No information	City ordinance initiated because of increased tree maintenance resulting from passengers entering and exiting vehicles parked too close to trees.
Tree Damage Settlements	Lansing, Michigan	Revenue from city insurance claims resulting from damaged trees (car accidents, vandalism, etc.) is placed in the general fund.

Figure 26. Funding Mechanisms

A4. Community Rehabilitation District Law of 1985

The 1985 law authorizes the establishment of benefit assessments. Rehabilitation district boundaries, however, may not overlap a redevelopment project area. Eligible improvements include sidewalks, curbs, and gutters. The district may issue bonds pursuant to the assessment proceedings of the 1911 and 1913 Acts. Most significantly, the district may issue senior obligation bonds. Senior obligation bonds are subject to majority approval by the electorate. The law also authorizes city councils to pledge any source of revenue to pay debt service, including, but not limited to, any fees or charges for services provided by facilities rehabilitated under the law. Amendments are pending that would further broaden the law to authorize cities to enter into cost-sharing agreements with property owners for the rehabilitation of hardscape improvements. These fees could then also be bonded.

A5. Assessment District Procedures

In general, assessment districts are established following satisfaction of detailed procedural requirements, including the preparation of engineering plans, specifications, cost estimates, the notification of property owners, and the opportunity for property owners to protest. Typically if owners of more than half of the property area to be assessed protest, the city council may not proceed unless four-fifths of the city council overrule the protest.

Obligation bonds under the 1975 Act must be authorized by a majority popular vote. Bonds under the 1911 and 1913 Acts and assessments under the 1972 Act are authorized by resolution of the city council.

A6. Cost-Sharing Experiments

The experiences of eight California cities that utilize cost-sharing with property owners to finance hardscape repair are discussed below. The experiences of two cities that have attempted unsuccessfully to implement cost-sharing programs are also presented. Five of the cities (Inglewood, Menlo Park, Newport Beach, San Mateo, Santa Monica) share costs for repairing sidewalks on an equal cost basis. One city (El Monte) shares the cost for sidewalk repair on a variable basis depending on the location. Three cities (Menlo Park, Newport Beach, San Mateo) pay 100% for driveway approaches, back of sidewalk paving, and park strip fill-in paving. Three cities (Alhambra, Newport Beach, and Santa Monica) utilize an assessment district as a basis to have property owners pay 100% of sidewalk repair costs.

B. Other Cities' Successful Programs

B1 Alhambra

A modified landscape and lighting assessment district was approved by the city council with virtually no resident opposition. The district is intended to completely renovate the city's street lighting system and to remove all existing neighborhood hardscape problems. The district is scheduled to exist for 15 years. The city's financial contribution to the program will come from a share of state gas tax monies and energy savings from the street light conversions that will be made. The assessment district supersedes the previous Lighting and Landscaping District No. 1 and is known as the City of Alhambra Public Works Maintenance and Improvement Assessment District No. 1. This district was structured to provide for the issuance of bonds, which were strictly prohibited under the provisions of the 1972 Act.

The city will repair over 200,000 square feet of damaged sidewalks and replace over 3,300 substandard street lights in areas throughout the town. The initial annual assessment for single-family residences is scheduled at \$38.44 and cannot increase by more than 5% annually. Multi-family residential, commercial, and industrial property assessments would be increased by a similar amount each year.

B2. El Monte

El Monte utilizes cost-sharing with property owners to fund a portion of the cost of hardscape improvements. Unlike other programs which apportion costs consistently (i.e. 50% city paid /50% resident paid repairs), El Monte's program is highly variable. For example, if the damaged sidewalk is located on a safe route to school, the city usually pays the entire repair cost. If the sidewalk is not on a major street, and is not a designated safe route, the city usually does not contribute to the repair. If the sidewalk is on an arterial street, but not part of a safe route, the city usually pays 50%.

B3. Inglewood

This city indicates that it utilizes cost-sharing with property owners as well as general fund revenues to fund hardscape improvements. The installation of sidewalks where none exist, the replacement of sidewalks damaged or off grade due to general deterioration and/or faulty installation (which is neither the fault of the property owner or the city of Inglewood) is paid for on an equal share basis. Both the property owner and the city pay 50%. An estimate and a promissory note is furnished to the property owner. This provides the property owner with the total cost calculated by the cost per square foot. Frequency of payment, amount, and date of payment will be agreed upon and entered as part of the promissory note. Once the promissory

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note has been executed and received by the city, the work will then occur. If the property owner refuses to sign the note, the assessment is recorded as a lien against the property. When necessary, repairs are made by the city under assessment district proceedings.

B4. Menlo Park

The city council approved a 10-year program for repair of damage caused by street tree roots to improvements within the public right-of-way. The program was implemented in FY 1986-87. The city authorized an allocation of \$60,000 annually from the Capital Improvement Budget and added one position in the Engineering Department to handle the implementation of the repair program. Menlo Park's cost-sharing formula is outlined below:

- a. Residential Areas
 - 1) 50%/50% sharing of costs between city and property owner for sidewalk and parking strip defects.
 - 2) 100% city paid repair of curb and gutter defects.
 - 3) 100% property owner paid for driveway approaches, back of sidewalk paving, and/or park strip fill-in paving.
- b. Commercial/Industrial Areas
 - 1) 100% city paid for curb and gutter defects.
 - 2) 100% property owner paid for all other repairs.
- c. Damage due to causes other than street tree roots are to be paid 100% by property owners. Also, the property owner is 100% responsible for repair to improvements on private property outside the public right-of-way.

The city's tree policy provides that the city pays for removal and replacement of problem trees and for root pruning when it resolves the problem.

B5. Newport Beach

This city utilizes cost-sharing with property owners, **1911 Assessment Act** and **1913 Assessment Act** Districts, Benefit Assessment Districts, and General Fund revenues to fund hardscape improvements. The city will pay:

- a. 100% of the cost of repairing concrete curbs and gutters.
- b. 100% of approaches at alley intersections.
- c. 50% of the cost of repairing standard concrete sidewalks adjoining private property.
- d. 100% of the cost of repairing standard concrete sidewalk and drive approaches damaged by trees in the city park strip.

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The city does not pay for:

- a. The cost of repairing concrete sidewalks and driveway approaches damaged by private trees.
- b. The cost of repairing private concrete driveway approaches including the sidewalk areas.

The General Services Department has been established a priority list, based on needs, benefit to the public, and date of application. Property owners requesting their projects to be advanced to the top of the priority list are requested to contribute an additional 50%. City participation under this policy is subject to the appropriation of funds.

B6. Redwood City

The goals of the Redwood City Comprehensive Sidewalk Reconstruction Program include evaluating damaged sidewalk locations (primarily where trees are involved), and determining if the location can be modified to allow the tree to survive.

The city pays for all repairs in designated highest priority areas that are identified by survey. If a homeowner requests immediate work in an area that has not been designated high priority by the city, the homeowner will be required to pay 50% of the cost. This option is only available to locations with a priority rating of 1, 2, or 3 (from most severe damage to least severe but growing damage). The location will be inserted into the current-year hardscape repair contract. The property owner must submit payment no later than 30 days prior to commencement of work. If the city does not receive payment, the repair work will be canceled and the repair project scheduled to its original position in the repair sequence.

It is estimated that Redwood City is spending approximately \$650,000 per year for an anticipated 40-year period. The funding for the program was made possible by a Utilities User's Tax that gives the city an annual revenue of approximately two million dollars for their Capital Improvements Fund (approximately \$36 per capita).

B7. San Mateo

In October 1979, the city established a ten-year program to cover the entire city for sidewalk repairs. The cost-sharing formula for residential areas is:

- a. 50%/50% sharing of costs between the city and the property owner for sidewalk defects.
- b. 100% city paid for curb and gutter defects.
- c. 100% homeowner paid for driveway approaches and back of sidewalk concrete of any kind.

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- d. Park strip fill-in paving is removed by the city and not replaced unless homeowner desires to do so at personal expense.

If property owners do not join the program during the time it is in effect, then they will be 100% responsible for repairs. Also, after the program is completed, future repairs to the sidewalks of participating residents will be paid 100% by the residents. 72% of the property owners participate, and overall reaction to the program has been favorable. Previously, commercial property owners were required to pay 100% for sidewalk repair but that policy was recently changed to include them in the 50%/50% program. This change was made because the city tended to get less participation from owners for commercial repairs. Repair areas are determined by request and by survey. The city is still using CDBG funding for sidewalk repairs in low income areas.

B8. Santa Monica

This city utilizes cost-sharing with property owners (in the form of a 1911 Assessment Act District Proceeding) as one source of funding hardscape improvements. The 1911 Act program began 10 years ago. The property owner and city each pay 50% of the repair cost through this procedure which has enabled the city to increase the number of sidewalk repairs by 80%. They find this to be particularly important in consideration of sidewalk damage liability exposure. The city assesses individual locations scattered throughout the community, rather than on the basis of entire blocks. This has cut down on resident protests significantly.

APPENDIX V
of 1606 Elm Trees
Summary of Findings

APPENDIX V
O'Toole Elm Trees
Summary of Findings

O'Toole Elm Trees Summary of Findings

The O'Toole Elm Tree site is a historic grouping of American Elm trees (*Ulmus americana*) planted in a double row from Main Street (northeast end) to Abel Avenue (southwest end). The existing stand consists of fifty-five (55) specimen trees and an estimated one-hundred (100) one foot (1') to ten foot (10'), second generation, root sprouts.

Utilizing the methodology and guidelines established by the International Society of Arboriculture and the Council of Tree and Landscape Appraisers, Sealana & Associates closely examined the subject trees and related environmental conditions.

All fifty-five mature trees are in a severe state of decline. This decline is attributed to severe and inappropriate "topping" and other trimming practices, which occurred within the past twenty years. These inappropriate "topping" and other trimming practices predisposed the trees to several wood decay organisms as well as insect and disease pathogens.

Utilizing the *Hazard Tree Evaluation*¹ methods, all mature trees were rated for potential failure and general safety. The entire stand is rated as a moderate to high risk due to the overall poor condition of the stand, severe tree defects, and the potential for causing damage or injury due to failures.

Second generation root sprouts, rated in moderate to excellent condition; offer the opportunity for perpetuation of the historic stand. Although not resistant to Dutch Elm Disease, these root sprouts could be cultivated, trained and combined with disease-resistant plantings (improved cultivars) to restore the historic grove.

Due to the moderate to high hazard potential of this stand, it is recommend the City of Milpitas prohibit public access and implement a phased removal of all mature trees in this stand. Nine (9) of the trees should be removed at once as they are imminent hazards. Remaining trees should receive safety pruning, in the interim, and be removed within the next five (5) years.

It is recommended that the trees be removed and replanted in the same locations using new disease resistant Elm cultivars replacing the entire grove over a period of years to preserve the

¹ Evaluating Trees for Hazards, International Society of Arboriculture (Clark & Matheny)

extant length of the grove. This will preserve the significant character-defining features of this historic landscape.

This renovation approach is supported by The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes. (published in 1996). These standards set the nationally accepted guidelines for dealing with historic landscapes. The guidelines address historic trees and clearly state the need to "recognize the continual process of germination, growth, seasonal change, aging, decay and death of plants." The preservation guideline supports "limited replacement in kind of extensively deteriorated portions of historic features." They even use the example that "... when matching plant materials are no longer commercially available, may not be hardy to a region, or are highly disease prone, substitute plants may be recommended."

A strong case can be made to plant the new disease resistant cultivars of elms rather than cloning trees that are genetically identical to the existing O'Toole Elms. Cloning from the existing diseased trees would potential act as a carrier to spread the Dutch Elm disease and threaten any remaining disease free trees in the region.

If there is a desire to maintain the genetic stock, it is recommend that a small number of the healthiest root sprouts be selected and maintained in place as long as they are free of Dutch Elm disease. If the disease manifests itself these root sprouts should be evaluated for removal to control the spread of the disease through the region. This would mean at least an annual evaluation of the trees. It is also important to recognize that these tree sprouts are not in the historic row alignment but are rather sprouts that are outside of the alignment. They would however offer an interpretive opportunity and maintain some of the historic gene pool for future research and study.

There are several alternatives to the timing of removal and replacement of the individual 55 trees. The final solution depends upon available funding and time frame of the development around the grove. It is recommend that at a minimum the 9 trees identified as imminent hazards are removed, the stumps ground and new trees planted in their exact alignment. A multi year program should then be instigated that removes a portion of the stand and replants beginning with the ones in the worst condition. This approach is recommended for two main reasons: it maintains the overall character of an enclosed allee for a longer period of time allowing newly planted trees to grow, and it spreads the capital expenditure over a number of years. While the trees will be different sizes for several years, they will upon maturity catch up to each other and create the same effect as the grove today.

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